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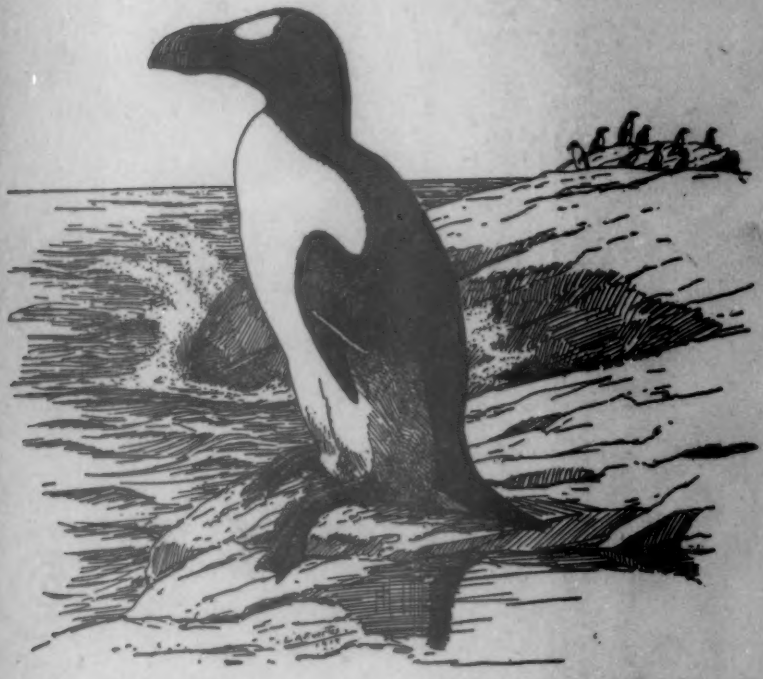

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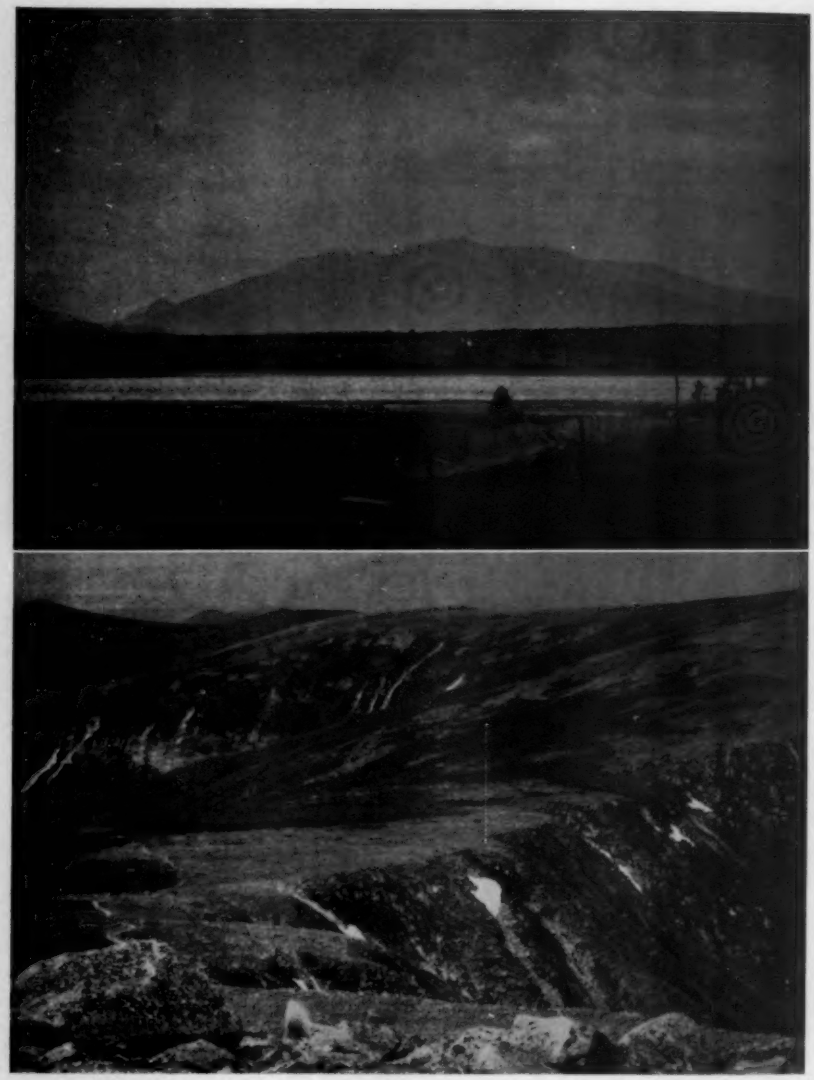

(*Upper*), MT. KATAHDIN FROM THE SOUTH. (*Lower*), EDGE OF THE SADDLE, JUNE 16, 1937. NOTE SNOW PATCHES.

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BIRDS OF THE MT. KATAHDIN REGION OF MAINE

BY RALPH S. PALMER AND WENDELL TABER

Plate 8

MOUNT KATAHDIN in Piscataquis County is the highest mountain in Maine and lies some 50 miles north-northeast of the geographical center of the state. The higher levels of the mountain form the largest and most elevated of the several subalpine areas in Maine and the most northern subalpine district in the United States east of Montana. It is about 115 statute miles, or almost two degrees of latitude, farther north than Mt. Washington in New Hampshire. In this general sector the only other extensive subalpine areas are those on Tabletop, Mt. Albert and Mt. Logan on the Gaspé Peninsula.

Situated in an extensive forest, Mt. Katahdin (Plate 8) rises from a base level of about 600 feet to an altitude of 5,267 feet, with six peaks over 4,600 feet high, and a relatively plain plateau, the Tableland, nearly three miles long, elevated above 4,000 feet. The crestline of the mountain might be likened to a gigantic fishhook with Pamola Peak the barb, Baxter Peak at the curve, and the chain of northerly peaks the shank. The distance from tree-line to tree-line over this route is approximately eight miles and involves a traverse of the six highest peaks. Baxter Peak, the summit of the mountain, is very nearly at 45° 54′ north latitude and 68° 55′ west longitude.

Many projecting arms box in numerous glacial cirques or basins. On the eastern side of the mountain are three of these, the Little North Basin with floor at about 2,600 feet, the Big North Basin with sloping floor at 3,100–3,300 feet, and the Great (including South) Basin with floor at 2,900 feet. The last-mentioned, originally well forested with spruce, was lumbered to about a half mile from Chimney Pond (alt. 2,914) early in the decade following 1920. With the light and sun now penetrating this area, an invasion of open-country

birds and other animals has recently taken place here. On the northwestern side are the Northwest Basin with floor at 2,900 feet, where snow may lie three feet deep on the shaded wall into mid-June, and the Klondike Basin with floor at about 3,400 feet. On the west, Katahdin falls off to a great boggy valley, the Klondike, at about 2,800 feet altitude. This bog is bounded on the south by Barren Mountain (alt. 3,681 ft.) and on the west by The Brothers (up to 4,143 ft.). There are, all told, ten satellite peaks above 3,000 feet high to the northeast, north and northwest of the mountain, with mountainous terrain continuing northerly for some 12 miles and culminating in the several peaks of the Traveler.

Mt. Katahdin is composed of a mass of coarse granite which disintegrates freely under the action of the weather, producing a coarse gravel which, with the accumulation of vegetable debris, forms a porous soil wherever the slope is not too steep to retain this cover. Above 3,000 feet, the sides of the mountain are abrupt, and wherever unprotected by vegetation are being constantly worn by moisture, wind and changes of temperature. In ancient times these flanks were severely eroded by glaciers. The Tableland is freely strewn with blocks and slabs of granite, quarried from the parent ledge through long ages of exposure.

The trees of the forest, predominantly spruce and fir, lose stature at the upper levels until they become a mass of scrub before reaching the edge of the Tableland. In the Saddle, a valley with its bed about 4,300 feet in altitude and between the parts of the mountain sometimes known as the North and South mountains, the scrub from the western flank continues nearly across to the eastern end of the valley. Another vast scrub area reaches to an altitude of nearly 4,500 feet at the north peaks. At higher levels, considerable areas of turf are found, formed of grasses, sedges and the rush, *Juncus trifidus* Linnaeus.

The country surrounding Mt. Katahdin contains innumerable bodies of water. Evaporation from these and from the forest ascends the mountain and, condensed as fog and heavy clouds, sweeps over the heights with great frequency or remains there for a few hours or even days. Rainfall is frequent and often almost torrential (Blake, 1927: 379). The total amount of moisture which falls upon the mountain is believed to exceed that of Mt. Washington (Williams, 1901: 161), but the clouds are less persistent and the amount of sunshine consequently is greater.

Winds of high velocity sweep over the mountain, along its flanks and through its basins throughout the year, probably during some

part of almost every day, though calm periods of a few hours' duration are frequent, even at the summit. Charles B. Fobes, a student of New England weather, stated (*in litt.*, March 6, 1945): "Although the average and extreme velocity of the winds of the Presidential Range in New Hampshire may be greater, a detailed study will probably reveal that the biotic conditions, level for level, are more severe on Mt. Katahdin." These wind conditions result in a scarcity of summer resident birds on the Tableland, although this area is well known as a "favorite hunting ground for strong-winged birds of prey," according to Blake (1931: 420) and to many observations made by Taber.

In dealing with the White Mountains, Glover Allen (1903) used the well-known terms proposed by C. Hart Merriam and called the three areas distinguished by earlier naturalists (summarized by Pease, 1924) Upper Canadian, Hudsonian and Arctic-alpine. He did not, however, make any reference to Katahdin in this connection. Aaron Young (1847) wrote the first specific remarks on zonation of the plant life on Katahdin. Antevs (1932), who summarizes much literature, refers to the mountain as having an Alpine zone. Knight (1908a) made a peculiar mistake in calling the upper zone "Hudsonian," basing his conclusions upon the evidence of ten plants. His claim for an avifaunal element rested upon the presence of Bicknell's Thrush—a bird pre-eminently Upper Canadian, in the Merriam sense of the term, in its faunal affinities. He repeats this error in his volume on Maine birds (Knight, 1908b: map in front of volume). Dr. Blake (1927), in his ecological studies at Katahdin, found the "Krumholz" (scrub or Hudsonian zone) too narrow in its altitudinal extent to harbor a fauna peculiar to itself, but to be populated by an overlapping of animals from above and below. This narrow band encircles the mountain and penetrates well into the sheltered section of the Saddle where the avifauna in scantily represented by such birds as Bicknell's Thrush, Black-poll and Myrtle Warblers, Slate-colored Junco and White-throated Sparrow. The only "alpine" bird believed to nest on the barren portion of the Tableland, is the American Pipit.

In unpublished notes on Katahdin, dating about 1937, the late Arthur Norton (*See* Auk, 60, 315–317) summarized the abundant and varied flora of the mountain as follows: "The flora has been well explored, showing about 62 lichens, 59 hepatics, 60 mosses, and about 250 flowering plants. Among the lichens the Families Lecidiaceae, Parmeliaceae and Cladoniaceae are conspicuously abundant, covering the rocks and scantier soil. The mosses are chiefly apocarpus,

and many lithophitic; some colonize the scanty soil and others the wet places and slopes. A few club mosses are common. Among the flowering plants are 23 species of grasses, 29 sedges, a few rushes, several dwarf willows and birches, a dozen species of Rosaceae, two crowberries, 24 heathworts, and various herbaceous plants including 13 Compositae." Some lichens have since been added by Degelius (Archiv för Botanik, 30: 1–62, 1942). This plentiful vegetation provides homes and shelter for various insects which, with the supply of fruits and seeds of various kinds, afford food for birds.

While the botanical literature for Katahdin is extensive, the bird literature is comparatively brief. Blake (1927) listed 35 species. The junior author's check-list (Taber, 1945) with brief annotations, lists 134 names and covers a wider area. Not all birds contained in the latter list are here included, since the present paper deals only with the mountain and its approaches, nor is his list cited in the many instances where records there presented are here elaborated or revised. Aside from these two papers, there are only a few scattered notes. All known important primary references are included in the appended bibliography.

Since only the "Katahdin, Me." quadrangle and not surrounding areas are available in U. S. Geological Survey topographic maps, a useful map covering a wider area is that accompanying the eighth edition (1945) of the Appalachian Mountain Club's "A Guide to Paths on Katahdin and in the Adjacent Region." Leavitt (1942) gives an excellent description of the region and some of its history; Antevs (1932) discusses its geology; and Smith and Avery (1936) compiled much of the literature on the mountain. These maps and publications are essential equipment for any student of the area.

Two localities, referred to below, need an explanation. Taber (1945: 366) called a small unnamed pond in Township 4, Range 11, Duck Pond. Eastward of the road and "barely if at all visible" from it, this pond is henceforth designated as 'Duck Pond' so as not to confuse it with the pond of the same name located at the western end of Upper Togue Pond. Some distance beyond 'Duck Pond,' and a half mile from the road along an unnamed brook, is 'Duck Pond Marsh' also so called by Taber (*ibid.*).

The late Arthur H. Norton was compiling a list of birds of the Katahdin region, which Palmer has continued. This paper includes their observations plus those of W. G. and Russell Fanning, E. H. Perkins, Mrs. I. H. Blake, A. S. Pope, W. H. Rich, Arthur Stupka, Mrs. Frank Lowe and the late J. F. Fanning. Taber's data include

observations made by himself, A. C. Bagg, G. L. Perry, O. K. Scott and H. McClure Johnson. To these persons the writers are greatly indebted.

There remains a dearth of winter and spring records for the region, while large areas on the lower levels of the mountain, in the surrounding forests, and on other satellite peaks have not been visited by an ornithologist at any season of the year. There is also need for judicious collecting to supplement the present list of sight records and to determine whether certain additional northern subspecies occur here, especially during migrations. Since Mt. Katahdin as a state park and the northern terminus of the Appalachian Trail will attract many people in the future, the authors feel that the present paper may arouse more interest in the birds of this region.

COMMON LOON, *Gavia immer immer*.—Summer resident and migrant, breeding on lakes near the mountain.

PIED-BILLED GREBE, *Podilymbus podiceps podiceps*.—Occurs regularly in summer on near-by lakes and ponds; probably nests.

DOUBLE-CRESTED COMORANT, *Phalacrocorax auritus auritus*.—A flock of about 100 "cormorants," undoubtedly this species, was reported seen at Sourdnahunk Lake, August 27–28, 1934 (Bosson, 1934). Norton saw a single bird at Millinocket Lake, August 12, 1936.

GREAT BLUE HERON, *Ardea herodias herodias*.—Of frequent occurrence in summer and more so in early fall. No nesting places located.

LITTLE BLUE HERON, *Ardea caerulea caerulea*.—A white-plumaged immature bird was collected at the eastern end of Millinocket Lake, August 25, 1936 (Mendall, 1937).

EASTERN GREEN HERON, *Butorides virescens virescens*.—"Bagg informs me one was shot in Sourdnahunk region" (Taber, 1945: 367). This is presumably the mounted bird referred to by Ritchie (1927: 14), which was found in a camp at Sourdnahunk Lake and was shot about ten years previously.

AMERICAN BITTERN, *Botaurus lentiginosus*.—Seen and heard by Bagg at Sourdnahunk Lake, May 29–June 3, 1940. One was recorded at 'Duck Pond Marsh,' September 2, 1939, by Taber.

COMMON CANADA GOOSE, *Branta canadensis canadensis*.—A small flock was seen and heard by Palmer at Windey Pitch, October 17, 1945.

BLACK DUCK, *Anas rubripes*.—Common summer resident and migrant on lakes and ponds near the mountain.

GADWALL, *Chaulelasmus streperus*.—One seen with Black Ducks at 'Duck Pond' September 12, 1933, by Taber and others. A bird seen in flight, June 22 and 29, 1945, at Sandy Stream Pond by Johnson, was probably of this species.

BLUE-WINGED TEAL, *Anas discors*.—One was seen by Bagg at Sourdnahunk Lake, between May 29 and June 3, 1940.

WOOD DUCK, *Aix sponsa*.—Occasional in summer and in migration. Nearest records to the mountain are those seen by Taber; one at Millinocket Lake, August 24, 1945, and a pair at 'Duck Pond,' September 12, 1933.

RING-NECKED DUCK, *Aythya collaris*.—A pair of adults and four young at 'Duck Pond,' September 2–3, 1939 (Taber, 1945: 367).

AMERICAN GOLDEN-EYE, *Glaucionetta clangula americana*.—Found regularly, during the decade before 1932, on lakes and ponds near the mountain by Norton and others; observed less frequently since then. Mrs. Blake saw a small flock alight on Upper Basin Pond (alt. 2,450 ft.) during a storm, July 19, 1923.

BUFFLE-HEAD, *Glaucionetta albeola*.—A flock of nine was reported "spending the summer" at Daicey Pond where they were seen in July, 1921 (Fanning, 1921).

WHITE-WINGED SCOTER, *Melanitta fusca deglandi*.—A single bird was seen at Millinocket Lake by Taber, August 17, 1942.

HOODED MERGANSER, *Lophodytes cucullatus*.—Common in summer; undoubtedly nests. There has been a marked increase in numbers during the past twenty years.

AMERICAN MERGANSER, *Mergus merganser americanus*.—Common in summer. Norton found it nesting at Togue Ponds in 1923. Mrs. Lowe saw a female with about a dozen flying young daily at Wassataquoick Lake, August 30–Sept. 6, 1940.

EASTERN GOSHAWK, *Accipiter gentilis atricapillus*.—Taber has three records: Frost Pond, September 16, 1933; an immature bird by the cliffs above Chimney Pond, August 19, 1942; and an adult above Pamola, August 12, 1945.

SHARP-SHINNED HAWK, *Accipiter striatus velox*.—Probably a summer resident: not rare.

COOPER'S HAWK, *Accipiter cooperii*.—Seven summer records between June 1 and September 15. The highest record is of one seen from Hunt trail, September 3, 1937, by Stupka.

EASTERN RED-TAILED HAWK, *Buteo jamaicensis borealis*.—Increasing and now seen regularly in summer. It may breed. The highest record is of one seen by Taber over Chimney Pond, August 19, 1942.

NORTHERN RED-SHOULDERED HAWK, *Buteo lineatus lineatus*.—One was seen by Mrs. Blake at Pamola Pond Bog (alt. 2,600 ft.), August 16, 1923. One at 'Duck Pond' and one at Ripogenus Dam, September 12, 1933; and two at Harrington Lake on September 15, 1933, all seen by Taber. Bagg has no records for his visits to the Sourdnahunk region.

BROAD-WINGED HAWK, *Buteo platypterus platypterus*.—Common in summer; nests. Mrs. Blake's high stations for 1923 are: Basin Ponds, August 1; Pamola Pond Bog, August 12; and near North Peak, circling at about 4,500 feet, August 31.

GOLDEN EAGLE, *Aquila chrysaetos canadensis*.—One was seen by Dr. Francis Harper from Index Rock on Pamola Peak, September 10, 1928. Another observer saw it at the same time and place [(Anonymous), 1928].

NORTHERN BALD EAGLE, *Haliaeetus leucocephalus washingtoniensis*.—Found regularly about the mountain and surrounding ponds and streams.

MARSH HAWK, *Circus cyaneus hudsonius*.—One was seen by Taber at 'Duck Pond Marsh' on September 2, 1939.

OSPREY, *Pandion haliaetus carolinensis*.—Seen regularly on surrounding ponds and lakes all summer. More numerous in fall migration. On September 7, 1937, Stupka saw one high over Chimney Pond, buffeted by strong winds and apparently trying to cross Katahdin in the region of the Saddle.

DUCK HAWK, *Falco peregrinus anatum*.—Has undoubtedly nested on Katahdin for many years. Breeding on the eastern side of the mountain (Carpenter, 1884b). Mrs. Lowe saw a pair calling anxiously as they flew about The Owl on August 4, 1926. Seen harrying a Golden Eagle on September 10, 1928 ([Anonymous], 1928). Taber has seen the species regularly during the summers of 1926–1945, in particular noting that it is seen frequently over the Tableland.

EASTERN PIGEON HAWK, *Falco columbarius columbarius*.—Occasional in summer. High records are of one seen near Saddle Slide by Norton on August 10, 1926, and two seen by Taber, one of which attacked a Duck Hawk over North Basin, August 18, 1945.

EASTERN SPARROW HAWK, *Falco sparverius sparverius*.—Occasional in clearings about the base of Katahdin; no breeding records. Rich saw one passing over the summit on August 10, 1926.

CANADA SPRUCE GROUSE, *Canachites canadensis canace*.—Resident but not numerous. The highest record is of one seen by Norton on the trail from Chimney Pond to Hamlin Ridge at about 3,400 feet on August 31, 1923. Moorehead (1922: 17) has an excellent photograph of one on the mountain. Considering the facts that Katahdin is a sanctuary and that no lumbering is permitted, this bird may increase in numbers.

CANADA RUFFED GROUSE, *Bonasa umbellus togata*.—This species is plentiful during some seasons on flanks of the mountain and in surrounding woods.

SEMIPALMATED PLOVER, *Charadrius hiaticula semipalmatus*.—Eight migrants were seen by Bagg at Sourdnahunk Lake on May 31, 1939.

AMERICAN WOODCOCK, *Philohela minor*.—Norton (1928: 70–71) records borings and tracks at City Camp, and a bird seen at Wassataquoick Stream on August 16, 1925. Taber heard the 'flight song' and saw the bird at Millinocket Lake in the evening of August 16, 1942.

SPOTTED SANDPIPER, *Actitis macularia*.—Regular summer resident and breeder on near-by ponds and lakes. Often seen along Wassataquoick Stream.

EASTERN SOLITARY SANDPIPER, *Tringa solitaria solitaria*.—Regular in spring and fall migrations on ponds and streams.

GREATER YELLOW-LEGS, *Totanus melanoleucus*.—A number of fall migration records; probably also occurs in spring.

HERRING GULL, *Larus argentatus smithsonianus*.—Found on surrounding lakes and ponds when ice-free. Not numerous. Said to nest at Millinocket Lake.

EASTERN SCREECH OWL, *Otus asio naevius*.—One was heard by Taber at Frost Pond on September 2, 1939.

GREAT HORNED OWL, *Bubo virginianus virginianus*.—Rather common. It undoubtedly nests. There are few records for late summer after the birds have ceased hooting. It was heard by Palmer near Chimney Pond on June 14, 1937. In view of the fact that three races of Horned Owl have been taken in Maine, it is probable that more than one race occurs occasionally in winter about the mountain.

NORTHERN BARRED OWL, *Strix varia varia*.—More numerous in summer than the Great Horned Owl and probably also in winter.

GREAT GRAY OWL, *Strix nebulosa nebulosa*.—No known records, although Carpenter (1884b: 9) suggested that it might breed in the vicinity of Katahdin.

SAW-WHET OWL, *Cryptoglaux acadica acadica*.—The most common raptor, at least in summer. A nest containing three young was found in a large birch near the base of Katahdin on April 30, 1881 (Carpenter, 1884a).

EASTERN WHIP-POOR-WILL, *Caprimulgus vociferus vociferus*.—Heard and seen at various points near the mountain in July and August. Taber heard one on Traveler Mountain on May 27–29, 1944.

EASTERN NIGHTHAWK, *Chordeiles minor minor*.—Breeds locally at lower levels. It is often seen in flocks during fall migrations. A flock of ten was seen by Johnson as early as July 3, 1945.

CHIMNEY SWIFT, *Chaetura pelagica.*—Frequently seen at all altitudes in summer. It undoubtedly nests here.

RUBY-THROATED HUMMINGBIRD, *Archilochus colubris.*—Occurs regularly in summer up to at least 3,000 feet. Rich saw one flying in a northwesterly direction over the summit on August 29, 1924.

EASTERN BELTED KINGFISHER, *Megaceryle alcyon alcyon.*—Common in summer, nesting in suitable places at lower levels.

NORTHERN FLICKER, *Colaptes auratus luteus.*—Common summer resident and common in migrations. High records are of one seen by Norton at Chimney Pond in August, 1923, and one seen by Taber at about 3,100 feet in North Basin on August 13, 1945.

NORTHERN PILEATED WOODPECKER, *Coephloeus pileatus abieticola.*—A common resident at lower levels.

YELLOW-BELLIED SAPSUCKER, *Sphyrapicus varius varius.*—A very common summer resident in mixed and hardwood growths.

HAIRY WOODPECKER, *Dryobates villosus villosus.*—A common summer resident. Winter birds are probably migrants from farther north. Norton and Fanning noted a brood, lately out of the nest, near Chimney Pond, June 13–18, 1936.

NORTHERN DOWNY WOODPECKER, *Dryobates pubescens medianus.*—Common at all seasons. Often seen as high as there are stunted trees except that none are reported from the Tableland.

ARCTIC THREE-TOED WOODPECKER, *Picoides arcticus.*—Resident but not common. Norton saw three, apparently part of a brood, at Basin Ponds Camp from July 26–August 3, 1923. It was seen in February, 1912 (Sayward, 1915).

AMERICAN THREE-TOED WOODPECKER, *Picoïdes tridactylus bacatus.*—One seen in August, 1923, by Mrs. Blake, on the trail between Chimney Pond and South Basin Slide. This species was noted on the mountain March 12, 1926 (Allis, 1926).

EASTERN KINGBIRD, *Tyrannus tyrannus.*—Recorded only as a fall migrant in the immediate vicinity. It undoubtedly breeds at points not too far distant.

NORTHERN CRESTED FLYCATCHER, *Myiarchus crinitus boreus.*—Taber has noted it as follows: Frost Pond on June 11, 1933; Trout Brook on May 27, 1944; and at two localities on Traveler Mountain on May 28–29, 1944.

EASTERN PHOEBE, *Sayornis phoebe.*—One was seen by Taber at either Crommet Farm or Shin Ponds on May 30, 1944. Two were seen by Bagg at Sourdnahunk Lake on May 31, 1940.

YELLOW-BELLIED FLYCATCHER, *Empidonax flaviventris.*—Common summer resident up to Chimney Pond.

ALDER FLYCATCHER, *Empidonax traillii traillii.*—The record nearest to the mountain is of one heard by Taber on May 27, 1944, at Trout Brook, at the base of Traveler Mountain.

LEAST FLYCATCHER, *Empidonax minimus.*—Abundant summer resident in forests.

EASTERN WOOD PEWEE, *Myiochanes virens.*—Common in suitable localities. Taber heard one on the lower slope of Hamlin Ridge, above 3,100 feet, on August 13, 1945.

OLIVE-SIDED FLYCATCHER, *Nuttallornis borealis.*—A regular summer resident as high as 3,000 feet in South Basin. A brood in South Basin was seen by Norton on July 30 and by Mrs. Blake on August 11, 1923.

NORTHERN HORNED LARK, *Otocoris alpestris alpestris.*—A single bird, at the base of Baxter Peak on August 19, 1942, was probably this race (Taber, 1945: 369). Found "wintering in the Katahdin area around the first of April, 1940" by Dr. O. K. Scott (Taber, *ibid.*).

TREE SWALLOW, *Iridoprocne bicolor.*—Locally common summer resident at lower levels.

BANK SWALLOW, *Riparia riparia riparia.*—Several were seen at Millinocket Lake by Taber on June 17, 1933, and by Johnson from June 24–July 5, 1945. On August 24, 1945, Taber found 41 nest holes in an old sawdust pile on the northern shore of Ambajejis Lake.

BARN SWALLOW, *Hirundo rustica erythrogaster.*—A locally common summer resident at lower levels.

NORTHERN CLIFF SWALLOW, *Petrochelidon pyrrhonota pyrrhonota.*—Some were noted in a mixed flock of swallows at Russell Pond on August 18, 1925 (Norton, 1928: 73); an unrecorded number were seen by Bagg at Sourdnahunk Lake on May 31, 1939; a colony was noted by Taber either at Crommet Farm or Shin Ponds on May 30, 1944.

PURPLE MARTIN, *Progne subis subis.*—Taber saw a single individual below Chimney Pond on June 14, 1933. There are no other records nearer than Millinocket.

CANADA JAY, *Perisoreus canadensis canadensis.*—Resident and probably a local migrant. It was seen at the north end of Katahdin in February, 1912 (Sayward, 1915). In 1937, Stupka was told that a flock of 25 to 30 spends the winters at McCarty's Camp and vicinity. Mrs. Blake records a "small flock" in the South Basin on August 28, 1923. Norton saw six together at the lower end of Sourdnahunk Lake on August 31, 1924. Ellicott (1908) has a photograph of one at a camp table at this same lake.

NORTHERN BLUE JAY, *Cyanocitta cristata bromia.*—Resident. It appears to have increased in the past 20 years. The highest record is of one seen by J. Fanning at Chimney Pond on June 17, 1936.

NORTHERN RAVEN, *Corvus corax principalis.*—Seen twice, "possibly the same bird both times," at an unstated locality (W. G. Fanning, 1921). Seen by Bagg at Sourdnahunk Lake (date not recorded). One was seen by Palmer at Windey Pitch on October 17, 1945.

EASTERN CROW, *Corvus brachyrhynchos brachyrhynchos.*—An uncommon summer resident. Very infrequent above 2,700 feet. Norton points out (1928: 72) that the crow is scarce in forested sections of Maine.

BLACK-CAPPED CHICKADEE, *Parus atricapillus atricapillus.*—An abundant resident as high as Chimney Pond. It is often seen at higher wooded points but has not been reported from the Tableland.

ACADIAN CHICKADEE, *Parus hudsonicus littoralis.*—Occurs regularly in small numbers. It was seen at the north end of Katahdin in February, 1912 (Sayward, 1915). On September 3, 1937, Stupka saw several at about 3,500 feet on the Saddle Trail.

WHITE-BREASTED NUTHATCH, *Sitta carolinensis carolinensis.*—One was seen by W. G. Fanning at Basin Ponds on July 30, 1923, and one by Johnson at Chimney Pond on June 24, 1945.

RED-BREASTED NUTHATCH, *Sitta canadensis.*—Common resident. In summer this species is often seen at high elevations in scrub growth. While on the Saddle, September 12, 1933, Brower saw one alight on the leg of a member of his party. The species was seen at northern end of Katahdin in February, 1912 (Sayward, 1915).

BROWN CREEPER, *Certhia familiaris americana.*—One was seen by Mrs. Taber at Abol Pond on June 16, 1933; one by Taber at Roaring Brook on August 21, 1942. Reported from Sourdnahunk Lake by Bagg at an unstated date.

EASTERN WINTER WREN, *Troglodytes troglodytes hiemalis.*—A plentiful breeder in forests, except birch and poplar areas, up to about 2,900 feet.

CATBIRD, *Dumetella carolinensis.*—One was seen by Johnson between Depot Camp and the park boundary on July 2, 1945.

EASTERN ROBIN, *Turdus migratorius migratorius.*—Not common. Small flocks occur in migrations as high as Chimney Pond. On a foggy day, September 4, 1931, Taber saw a migrating flock at an altitude of about 4,500 feet on the Tableland.

EASTERN HERMIT THRUSH, *Hylocichla guttata faxoni.*—A common summer resident at least as high as Basin Ponds. Stupka noted them feeding on fruits of *Prunus pensylvanica* near Katahdin Lake on September 6, 1937.

OLIVE-BACKED THRUSH, *Hylocichla ustulata swainsoni.*—An abundant summer resident to about 3,000 feet. Theirs is the most conspicuous song at Chimney Pond in June.

BICKNELL'S THRUSH, *Hylocichla minima bicknelli.*—At least five individuals were singing at unspecified points along the South (or Abol) Slide and well up in the scrub on the Tableland from June 22–23, 1897 (F. H. Allen, 1898). The species was heard singing on the Tableland by Palmer on June 16, 1937. "Gross writes that he has seen the bird on Mt. Katahdin" (Wallace, 1939: 249). "Uncommon, above 2,800 feet" (Taber, 1945: 368). These and numerous recent records would indicate that the bird is probably a fairly common summer resident. It has been heard singing after dark.

VEERY, *Hylocichla fuscescens fuscescens.*—Seen at the following localities: birch woods some five miles in from Millinocket on June 17, 1933; Trout Brook on May 27, 1944; and East Branch of Penobscot River just below the outlet to Matagamon Lake, May 29 and 30, 1944 (Taber, 1945: 369).

EASTERN BLUEBIRD, *Sialia sialis sialis.*—A rare summer resident in suitable habitat at lower levels.

EASTERN GOLDEN-CROWNED KINGLET, *Regulus satrapa satrapa.*—A summer resident to the upper limits of tall spruces. Palmer found it in abundance from Windey Pitch to Chimney Pond and back, October 14–19, 1945. It was not seen by Scott on a trip from Millinocket to the summit of Katahdin and back, March 31–April 3, 1940.

EASTERN RUBY-CROWNED KINGLET, *Regulus calendula calendula.*—Occasional in summer. Probably a rare and local breeding bird.

AMERICAN PIPIT, *Anthus spinoletta rubescens.*—Common at higher elevations in fall. Probably a summer resident. Dugmore (1901: 559) saw two birds together on the Tableland, apparently in August, 1900, although it is impossible to determine the date from his writings. In 1922, Norton and Perkins saw a small flock on the southern end of the Tableland on September 18. Mrs. Lowe saw five on the Tableland on September 5, 1932. A. E. Brower saw three north of Klondike Pond on September 12, 1933, and a single bird at Thoreau's Spring on July 9, 10 and 11, 1934. Arthur Stupka saw two near North Peaks on September 2, a flock of 25 and numerous small groups near the summit and along Knife Edge on September 7, and two on rocks at the margin of Chimney Pond on September 8, 1937. In 1939, several were seen on May 31 "near Katahdin" by Bagg (Taber, 1945: 370). In the same year, A. E. Brower was on the mountain July 8 and 9 and observed a pair which showed concern whenever he was anywhere within a considerable area. They had food in their beaks often enough for him to suspect that they might be feeding young. He failed to find a pipit's nest in the vicinity but did locate one of a junco. About July 10, at this same place, Dick Holmes (a Katahdin ranger) found the nest of a bird and he described the parent as having white in its tail and that, when walking, the bird wagged its tail. In late August, Maurice Sullivan

(a Park Naturalist at Acadia National Park) visited the site with Holmes and removed a remaining unhatched egg. This was submitted to Mr. Dean Amadon at the American Museum of Natural History for critical comparison with material there. Amadon's conclusions were that "the egg is typical of those of the Pipit, and considerably different than those of any other Maine-nesting species, though it might fall within the color range of a few sparrows." A knowledge of this matter, gained from Sullivan, is the source for the statement by Tyson and Bond (1941: 68) that this species is "said to nest on the summit of Mount Katahdin." On July 20, 1940, Bunting (1944) saw four pipits "on a rock-strewn meadow slightly above 4,000 feet, about one mile southwest of Baxter Peak on the Appalachian Trail." On June 24, 1945, Johnson saw a single bird on the northwestern side of Baxter Peak. On August 16, 1945, Taber saw one at the outer end of the south arm of the Northwest Basin. Parenthetically it may be noted that there are pipit records for Maine as follows: several in May, one on June 1, at least one in early August, one in late August, and numerous September dates. Further, a pair of these birds was seen by Howard Mendall near the summit of Mt. Madison, New Hampshire, on July 20, 1937. This species breeds on the Gaspé Peninsula (Townsend, Auk, 40: 85–87, 1923).

CEDAR WAXWING, *Bombycilla cedrorum*.—Common to abundant in summer about burned areas, clearings, ponds and streams.

NORTHERN SHRIKE, *Lanius excubitor borealis*.—One was seen at an unstated point between Millinocket and the mountain about April 1, 1940, by Dr. O. K. Scott.

STARLING, *Sturnus vulgaris vulgaris*.—A number seen by Taber at York's Garage on June 12, 1933. Bagg saw several at Sourdnahunk Lake on May 31, 1939, and May 29–June 3, 1940. They are, of course, plentiful in Millinocket.

BLUE-HEADED VIREO, *Vireo solitarius solitarius*.—Frequent in summer at lower levels.

RED-EYED VIREO, *Vireo olivaceus*.—Very common in mixed woods around and on the mountain. Norton saw one at Chimney Pond on July 29, 1923, and heard one singing frequently between Depot Camp and Lower Basin Pond in June, 1936.

PHILADELPHIA VIREO, *Vireo philadelphicus*.—One was noted at Frost Pond on June 12, 1933. Bagg saw one at Sourdnahunk Lake on June 2, 1940. A mixed flock of these and Red-eyed Vireos, both species singing, was observed near Sandy Stream Pond on August 18, 1942, by Taber who thinks it quite possible that the Philadelphia Vireo breeds there (Taber, 1945: 370). Two were seen by him at different points along Roaring Brook on August 23, 1945.

BLACK AND WHITE WARBLER, *Mniotilta varia*.—A common summer resident in surrounding areas and on the slopes of the mountain to perhaps 3,000 feet. Norton observed one singing at Chimney Pond on July 31, 1923, and Taber saw one there on August 13, 1945.

TENNESSEE WARBLER, *Vermivora peregrina*.—One was seen by G. L. Perry about seven miles from York's Garage towards Ripogenus Dam on June 13, 1933. The species was seen by Taber at three different points in *Populus tremuloides* growth on Traveler Mountain, May 27–28, 1944, and at Ambajejus Lake on August 25, 1945.

NASHVILLE WARBLER, *Vermivora ruficapilla ruficapilla*.—An abundant summer resident, especially in areas once burned over. It was seen at Chimney Pond by Stupka on September 8, 1937, and by Taber on June 14, 1933, and August 23, 1945.

NORTHERN PARULA WARBLER, *Compsothlypis americana pusilla*.—A common summer resident in the area to perhaps 3,000 feet. Records indicate that this species may have increased markedly in the last 20 years.

YELLOW WARBLER, *Dendroica petechia.*—A bird of questionable subspecies, seen by Taber at Millinocket Lake on August 25, 1945, furnishes the record closest to the mountain.

MAGNOLIA WARBLER, *Dendroica magnolia.*—A common summer resident at least as high as Basin Ponds. On Abol Trail above 4,000 feet, Brower saw a bird apparently carrying food for young on July 11, 1934.

CAPE MAY WARBLER, *Dendroica tigrina.*—Observed four times by Taber: an abandoned farm near Spencer's Camp on June 17, 1933; an adult male near the lower end of Roaring Brook trail on August 21, 1942; one adult near Rum Brook on August 23, and two adults and one or more immature birds at Ambajejus Lake on August 24, 1945.

BLACK-THROATED BLUE WARBLER, *Dendroica caerulescens caerulescens.*—Common in summer in open deciduous woods and mixed growths at lower levels. Taber saw an adult male at Chimney Pond on August 19, 1945.

MYRTLE WARBLER, *Dendroica coronata coronata.*—An abundant summer resident to 3,000 feet and a migrant throughout the area. Latest dates for the Tableland are September 7, 1934 (Bosson, 1934), and September 18, 1922, when one was seen by Norton.

BLACK-THROATED GREEN WARBLER, *Dendroica virens virens.*—An abundant summer resident and migrant. It was seen on the Saddle on September 7, 1934 (Bosson, 1934).

BLACKBURNIAN WARBLER, *Dendroica fusca.*—A fairly common summer resident. High records are from Chimney Pond where one was heard singing by Norton, June 13–16, 1936, and the Tableland where the mummified remains of an adult male were found by J. F. Fanning on June 17, 1936.

CHESTNUT-SIDED WARBLER, *Dendroica pensylvanica.*—A rare and local summer resident near the mountain. It is more numerous in migration.

BAY-BREASTED WARBLER, *Dendroica castanea.*—A frequent summer resident in coniferous forests, apparently tending to be somewhat colonial.

BLACK-POLL WARBLER, *Dendroica striata.*—A common summer resident to points well above Chimney Pond. Abundant in migrations.

NORTHERN PINE WARBLER, *Dendroica pinus pinus.*—One, perhaps the same individual, was seen at Chimney Pond by Taber on August 19 and 22, 1945.

WESTERN PALM WARBLER, *Dendroica palmarum palmarum.*—One was seen with a Yellow Palm Warbler by Taber, Perry and Clarke near Harrington Lake on September 12, 1933 (Taber, 1945: 370).

YELLOW PALM WARBLER, *Dendroica palmarum hypochrysea.*—Five records by Taber: near Harrington Lake on September 12, 1933; one at 'Duck Pond' and one at York's Garage on September 2, 1939; one at Millinocket Lake on August 17, 1942; and one at the same place on August 25, 1945.

OVEN-BIRD, *Seiurus aurocapillus.*—A rare and local summer resident and migrant. Norton heard one singing above Basin Ponds on June 13, 1936.

NORTHERN WATER-THRUSH, *Seiurus noveboracensis noveboracensis.*—An abundant summer resident in suitable habitat throughout the region. The highest record is for Chimney Pond where one was seen by Johnson on June 25, 1945.

MOURNING WARBLER, *Oporornis philadelphia.*—One was seen at Frost Pond on June 12, 1933; one near the junction of Roaring Brook and Sandy Stream Pond trails on August 21, 1942 (Taber, 1945: 371). Johnson saw one at the end of the road at Roaring Brook on June 26, 1945.

NORTHERN YELLOW-THROAT, *Geothlypis trichas brachidactyla.*—Common in suitable habitat as high as Basin Ponds.

CANADA WARBLER, *Wilsonia canadensis*.—A common summer resident. It appears to have increased in the past twenty years. It was seen by Taber at Chimney Pond on August 19, 1945.

AMERICAN REDSTART, *Setophaga ruticilla*.—A regular summer resident in small numbers. There are a number of August records for Chimney Pond.

BOBOLINK, *Dolichonyx oryzivorus*.—Bagg saw several near Sourdnahunk Lake on May 31, 1939, and May 29–June 3, 1940.

EASTERN MEADOWLARK, *Sturnella magna magna*.—Seen daily by Bagg at Sourdnahunk Lake, May 29–June 3, 1940.

EASTERN RED-WING, *Agelaius phoeniceus phoeniceus*.—A female was seen by Norton at Katahdin Lake on August 2, 1923. A number "appeared to be on a breeding ground" in a swamp at the southern end of Russell Pond, August 17–18, 1925 (Norton, 1928: 72). The species was seen by Bagg at Sourdnahunk Lake from May 29 to June 3, 1940.

BALTIMORE ORIOLE, *Icterus galbula*.—Seen at Sourdnahunk Lake by Bagg on an unstated date. One was seen by Johnson on July 3, 1945, between Depot Camp and the park boundary.

RUSTY BLACKBIRD, *Euphagus carolinus*.—Uncommon in marshy areas at lower levels in summer. It probably nests.

BRONZED GRACKLE, *Quiscalus versicolor*.—The records from nearest to the mountain are from the southeastern end of Sourdnahunk Lake where Norton saw one on August 31, 1934, and Frost Pond where two were seen by Taber on September 2, 1939.

SCARLET TANAGER, *Piranga olivacea*.—A male was seen in the birch forest about two miles southeast of Millinocket Lake on June 17, 1933; one was heard at Howe Brook at the base of Traveler Mountain on May 27 and 28, 1944; one was seen at Roaring Brook on August 23, 1945, all by Taber; one was noted at the end of the road at Roaring Brook on June 27, 1945, by Johnson.

ROSE-BREASTED GROSBEAK, *Hedymeles ludovicianus*.—One was seen by Taber at Frost Pond on June 12, 1933. Taber also found it common in a burnt-over area on Traveler Mountain in May, 1944. Stupka saw one at about 2,500 feet, below Chimney Pond, on September 8, 1937. One was seen at Sandy Stream Pond by Johnson on June 27, 1945, and one by Taber on August 14, 1945.

EASTERN PURPLE FINCH, *Carpodacus purpureus purpureus*.—A not uncommon summer resident at lower levels.

CANADIAN PINE GROSBEAK, *Pinicola enucleator leucura*.—One was seen by Taber at Chimney Pond on September 10, 1926. It was reported at Sourdnahunk Lake by Bagg at an unstated date.

COMMON REDPOLL, *Acanthis flammea flammea*.—Considered "common" on the mountain, March 31–April 3, 1940, by Dr. O. K. Scott (Taber, 1945: 371).

NORTHERN PINE SISKIN, *Spinus pinus pinus*.—One was noted on the Saddle on September 7, 1934 (Bosson, 1934). Stupka saw a small flock at Depot Camp on September 6, 1937. Taber saw a large flock at Chimney Pond on August 17, 1942, and a single individual on August 20, 1945. Johnson saw a single bird flying over Chimney Pond on June 24, 26 and 27, and one at Basin Ponds on June 27, 1945.

EASTERN GOLDFINCH, *Spinus tristis tristis*.—Of regular occurrence in summer, with stragglers reported as high as 4,200 feet.

RED CROSSBILL, *Loxia curvirostra* subsp.—Of regular occurrence, at least during July, August and September. It prefers solid stands of spruce where its presence is contingent on a good cone crop.

WHITE-WINGED CROSSBILL, *Loxia leucoptera leucoptera.*—Of varying status in different seasons. Periods of abundance have been the late summers of 1922, 1923, 1925 and 1938.

EASTERN SAVANNAH SPARROW, *Passerculus sandwichensis savanna.*—Records closest to the mountain are those made by Bagg daily at Sourdnahunk Lake from May 29 to June 3, 1944.

SLATE-COLORED JUNCO, *Junco hyemalis hyemalis.*—The most abundant summer resident of the spruce growth on the mountain. It is often seen on the Tableland where it nests. In 1937 a pair was apparently nesting among large boulders about 100 feet southwest of the summit. Norton found a nest with young about a week old near Basin Ponds on June 13, 1936.

EASTERN CHIPPING SPARROW, *Spizella passerina passerina.*—Seen occasionally in summer in the forest near the base of the mountain. Common in open surrounding country.

WHITE-THROATED SPARROW, *Zonotrichia albicollis.*—An abundant summer resident, especially in low evergreen woods. It is probably more numerous than the junco, taking the park as a whole. One was seen near Caribou Spring on the Tableland by Palmer on June 16, 1937.

LINCOLN'S SPARROW, *Melospiza lincolnii lincolnii.*—An adult was seen with Song Sparrows at Roaring Brook by Taber on August 23, 1945.

SWAMP SPARROW, *Melospiza georgiana georgiana.*—One was seen at Harrington Lake by G. L. Perry on September 14, 1933 (Taber, 1945: 372). One was seen by Johnson in a marshy area near Sandy Stream Pond on June 27, 1945.

EASTERN SONG SPARROW, *Melospiza melodia melodia.*—Of regular occurrence in summer in clearings at lower levels. Taber observed one at Blueberry Knoll (alt. 3,060 ft.) in North Basin on August 13 and 14, 1945.

EASTERN SNOW BUNTING, *Plectrophenax nivalis nivalis.*—Probably occurs regularly in fall and winter. Dr. O. K. Scott reported it "common" on a trip from Millinocket to the summit of Katahdin and back, from March 31 to April 3, 1940. Charles J. Maynard (1871: 372) wrote: "This species may breed on the tops of some of the ranges of Maine and New Hampshire. I have a note of a well authenticated instance of a large flock being seen on Mount Katahdin, in early August, 1869." The supposed breeding of the bird in Massachusetts, New Hampshire and Maine seems to have appeared in print as early as 1844, with DeKay, when "Snow Bird" was commonly used as a homonym for this species and *Junco hyemalis.* Such supposed breeding was dismissed—so far as Massachusetts and New Hampshire were concerned—by Brewster in a footnote in his edition of Minot's work (Minot, 1895: 193). In the interim the alleged record for Katahdin was well disseminated by inclusion in Minot (1877: 186) and Stearns (1881: 232). G. M. Allen (1909: 151) cites this report from Minot, not from the original source. Exploration of mountain areas in New England has shown the bird to be absent in summer, except perhaps casually. On October 31, 1923, Maynard wrote A. H. Norton as follows: "I have no recollection of the note . . . nor from whom I obtained it. I find nothing regarding it in any of my notebooks of that date. . . . I must have been satisfied of the authenticity of the information." There seems to be no record of an ascent of Katahdin in 1869, so that the source for Maynard's "well authenticated" report cannot be traced at this late date.

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Vassar College
Poughkeepsie, New York
3 Mercer Circle
Cambridge, Massachusetts

BIRD DETECTION BY RADAR

BY IRVEN O. BUSS

THE detection and interpretation of reflected radio waves from flying birds began with the development of radar prior to America's entering World War II. Throughout the war sudden and mysterious radar signals rushed combat men to battle stations, sent fighter planes on 'goose' chases, prompted lookouts to report unidentified aeroplanes diving into the sea, gave rise to several E-boat scares, started at least one invasion alarm, and tested the vocabulary of many skippers. Today, after more than four years, interpretation of some of these targets becomes possible.

McKay (1945), of the Admiralty Miscellaneous Weapon Development Department, quoted passages from a German document prepared during 1945 under the heading "Spurious Echoes" (*Scheinziele*) which suggest that the Germans saw echoes on their radar caused by birds, but they said: "It is probably a matter of sharply bounded layers of discontinuity in the atmosphere."

Phantom signals puzzled American submariners operating about the islands south and east of Japan. Their radars showed inexplicable signals from unidentified targets that sometimes came in on collision courses at up to 36-knot speeds. Scores of explanations from four-stripers to radar strikers resulted, yet no one suspected birds.

During the summer of 1941, "Dr. E. S. Shire, then developing centimetric radar equipment at the Air Defense Research and Development Establishment, Ministry of Supply," reported "that birds can reflect radio waves with sufficient strength to be detected by radar sets" (Lack and Varley, 1945). The same writers report that "Since 1941, there have been numerous well-authenticated records of birds being detected by radar, first from England, then from Malta and Gibraltar, and later from New Zealand and the United States of America. Indeed, with the introduction of higher-powered transmitters late in 1943, bird echoes became such a menace on British coast-watching equipment that we specially trained radar operators to distinguish them from echoes of operational importance."

Reports of bird detection by American radars were similar to those reported from other countries. Brooks (1945) recorded the observations of a naval officer on duty in the Pacific, saying " . . . that on numerous occasions the radar equipment in use on his vessel has detected the presence of good-sized birds, albatrosses, man-o'-war birds, etc., at distances as great as five or six thousand yards. When distances as shown by instrument were checked against ocular estimates

of distances of approaching birds from the vessel it was found that the two figures were in close agreement." The veil of enigma surrounding interpretation of radar signals caused by birds had lifted. However, flight speeds based on radar tracks were not reported.

A radar track was identified by a naval vessel on April 24, 1945, as a group of birds flying at an average speed of 27 knots. This target was picked up by radar at seven miles and subsequently identified by specially trained lookouts as a legion of ponderous, flapping birds which they thought were pelicans. Another ship reported a radar track on a tight formation of more than 50 birds of unidentified species flying northwestward at an altitude of 200 feet. This second group was tracked on April 22, 1945, and showed speeds varying from 60 to 100 knots. On five other occasions, these two ships experienced the same 'ghost' targets, and on March 25, 1945, another ship detected a target in the same area that tracked with a variable speed ranging from 20 to 70 knots. Certainly both land-based and ship-borne radar operators developed other tracks of flying birds. That these birds were not positively identified is largely due to the fact that few radar operators are ornithologists.

The writer's assignment as Fighter Director Officer aboard a U. S. Naval ship involved the daily use of radar. Continued vigilance for the mysterious signals was maintained in the hope that eventually such targets would be detected on the ship's radar. Not until October 19, 1945, did such an opportunity arise. At 2001 (8:01 P. M.) local time, when off the coast of China in the Yellow Sea, signals were intercepted on one of the ship's radars that corresponded exactly to those reported in July, 1945. Birds were immediately suspected, but darkness prevented a visual check of the target. The track of this target showed that its altitude was low, that it was on a true heading of 205 degrees, and that during the seven miles it was tracked its average speed was 27 knots.

Twenty minutes after the first target was intercepted (2021 or 8:21 P. M.), signals were detected on the radar screen that looked and behaved in similar fashion. Again it was on a southern course (180 degrees true), traveled relatively low to the water, and averaged 30 knots over a six-and-a-half-mile track.

Target number three was detected at 2120 (9:20 P. M.) and looked no different than the other two 'ghosts.' Like numbers one and two, it was low to the water, traveled southward (195 degrees true), and averaged 31 knots.

At nine minutes after eleven (2309) the fourth radar contact was

made. The completed track showed a southerly course (220 degrees true) and a speed of 29 knots.

The fifth and last target tracked during darkness was picked up at eleven minutes after five (0511) on the morning of October 20. Like the preceding four targets, it was traveling southward (202 degrees true) and was averaging about the same speed (26 knots). A comparison of the five summary plots showed that in each case the target was picked up at a similar short distance, traveled at low altitude, tracked for about seven miles, averaged between 26 and 31 knots, *and was on a southward course (from 180 to 220 degrees true).*

Daylight revealed many flocks of migrating waterfowl. The heavy flight consisted almost entirely of ducks, and at least three-fourths of the ducks were Pintails (*Anas acuta acuta*).[1] The flocks were small to medium in size (none over a hundred), and all were flying 200 feet or less above the sea. Every bird was on a similar south-bound course!

A direct and efficient communication system between the radar station below decks and a visual lookout station topside made it possible to check radar targets by ocular observations. Only some of the flocks were detectable by radar. Some of these did not remain on the screen long enough to be tracked. There was a minimum flock-number which gave a trackable signal. Other types of radar used on higher-flying ducks would doubtless give different results, but the radar-signal characteristics would remain basically the same. Attempts to identify visually flocks of ducks that were trackable on radar were successful in two cases. The largest flocks, that were easiest to track, stayed farthest from the ship and made positive identification difficult.

A flock of some fifty Pintails flying between 150 and 200 feet above the sea was tracked on a course of 185 degrees true for seven miles and showed an average speed of 29 knots. The second flock was mixed, consisting of forty-one Mallards (*Anas p. platyrhynchos*) led by five unidentified species (probably *Anas crecca crecca*) which resembled the American Blue-winged Teal. This flock was at the same altitude as the flock of Pintails, flying on a true heading of 192 degrees, and averaged 28 knots. The wind at this time was from 315 degrees true with a velocity of 7.5 knots, which would not noticeably affect the duck's flight speed. The appearance and behavior of the radar signals from both flocks were indistinguishable from those detected during the night, and they leave no question as to their identity.

All of the speeds measured during these observations were within narrow range limits (26 to 31 knots). A flock of Gray Geese tracked

[1] Classifications used in this paper are based on Hachisuka, et al., 1942.

by Lack and Varley on January 12, 1945, traveled with an air speed of about 25 miles per hour, which is close to the above range of flight speeds. Cooke (1939), however, shows six different flight speeds for Mallards ranging from 46 to 60 miles per hour, and two flight speeds for Pintails of 52 and 65 miles per hour. It is highly probable that birds greatly accelerate their flight speeds for short periods of time when they are frightened or pursued, but this study shows that some ducks migrate at much slower speeds than is claimed by many writers.

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1101 Third Street
Menomonie
Wisconsin

THE BIRDS OF MONA ISLAND, PUERTO RICO

BY VENTURA BARNÉS, JR.

MONA ISLAND is located in Mona Passage, forty-eight miles off the west coast of Puerto Rico and thirty-two miles off the east coast of Hispaniola. From a geological standpoint, it is volcanic in nature and is of relatively recent origin, pertaining to the Pliocene Period of the Tertiary.

From near at hand Mona gives the impression of an inaccessible rock emerging from the bottom of the Caribbean, with a barren tableland on the summit, bounded by sharply-cut, precipitous cliffs. The island has an area of approximately twenty-four square miles. Toward the southeastern section a level coastal plain extends from Sardinera to Uvero Beach on the extreme east-southeast coast, reaching the abrupt cliffs at the eastern point called Caigo o no Caigo. The plain has an average width of about one mile and is approximately eight miles long. A narrow dirt road has been made from Sardinera to

Uvero, through the thick vegetation in the vicinity of Uvero Beach, and then continues beyond Uvero, to climb the steep talus of the limestone plateau and reach the lighthouse on the northeast cape. The semi-arid coastal plain covers approximately eight hundred and forty acres of level, sandy soil. The rest of the island consists of a high limestone plateau or meseta with an altitude varying from 130 to 190 feet, without hills or considerable elevations. In the middle section there exists a considerable depression, with very sparse, red loam soil where the vegetation is more exuberant and the humidity higher. This point is known as Los Cerezos. Scattered throughout the island are many caves and deep crevices connected with each other underground, forming long, tortuous tunnels where the humidity is very high.

There are no streams or ponds, with the exception of a small swampy area of brackish water covered with mangroves about one mile from Sardinera Beach in an easterly direction. A few water holes are scattered throughout the limestone plateau and the coastal plain. Heavy showers are frequent especially during the evening from May to July, which is the rainy season.

Although the soil is thin, most of the island is covered with the thick vegetation, typical or semi-arid regions, where cacti and other xerophytes abound. Shrubs and medium-sized trees are well established, forming small associations on the slope of the cliff toward the coastal plain. Here the humidity is much higher than in other sections, permitting more luxuriant growth of trees and plants in general. Guinea grass (*Panicum maximum*) and wild cotton (*Gossypium* sp.) have been introduced and are now growing in the littoral of the south coast. The Guinea grass covers most of the level land where it grows to best advantage. When cotton is in bloom its thick stands are speckled with white and yellow flowers, forming a beautiful contrast to the background.

The edges of the limestone plateau consist of sharp, precipitous escarpments which render it inaccessible along the north, northwest and northeast coasts. The only possible and accessible anchorages around the island, which at best are not too reliable shelter, are Sardinera (southwest coast), Uvero (south coast), and Playa de Pájaro (east coast). There are a few trails leading from the coastal plain to the upper portions of the limestone meseta which ascend the barren cliffs at a sharp angle.

A large section, covering several acres, in the vicinity of Sardinera Beach has been planted with casuarina trees (*Casuarina equisetifolia*)

by the Forest Service. The "pines" have developed very well under the conditions found in the island so that there is a thick stand called "Pine Growth" covering all that level, sandy area.

As far as I am aware, few ornithologists have visited Mona. In 1878, Gundlach mentions wings of a paroquet from Mona, killed by Dr. Block, of Mayaguez. W. W. Brown, Jr., traveling for C. B. Cory, collected on the island in February, 1892. B. S. Bowdish visited Mona in August, 1901. Karl P. Schmidt landed on Mona in 1919 and listed twenty-two species of birds. Parke H. Struthers worked on Mona in July, 1921; and Dr. H. E. Anthony, from the American Museum of Natural History, investigated the cavern deposits there in 1926. Dr. S. T. Danforth accompanied by J. Adjer Smyth visited the island for three days, from April 14 to 16, 1935. On this trip they recorded the Dominican Sparrow Hawk, *Falco sparverius dominicensis.*

The writer saw Mona first in 1941, making a few records of the birds. From September, 1943, to June, 1945, he had the privilege of visiting the island regularly every month in connection with the establishment of fisheries activities and a biological survey of the waters adjacent to the island. Every opportunity was taken for the study of the birds with special attention devoted to the migrants.

The fauna of Mona Island is limited, and in general includes those species to be expected in a dry, tropical climate. Mammals, reptiles, insects, and birds are poorly represented. Only eleven forms of land birds are known to occur on Mona, and four of these are migrants. *Agelaius xanthomus monensis,* recently described from material from Mona, is the only endemic form.

During the writer's work, one hundred and twenty-two birdskins were collected, representing thirty-seven species. Six other species are added on sight records: *Puffinus lherminieri lherminieri, Oceanodroma leucorhoa leucorhoa, Pelecanus occidentalis occidentalis, Nyctanassa violacea violacea, Anous stolidus stolidus,* and *Pandion haliaetus carolinensis.* There are included two records made by Danforth, *viz., Falco peregrinus anatum,* and *Arenaria interpres morinella* (*see* Auk, 53: 100, January, 1936); and seven species listed by Dr. Alexander Wetmore from Mona Island, *Oreopeleia montana montana, Oreopeleia chrysia, Aratinga chloroptera maugei, Coccyzus americanus americanus, Tolmarchus taylori, Progne dominicensis,* and *Seiurus motacilla* ('Birds of Porto Rico and the Virgin Islands,' New York Academy of Sciences, Sci. Surv. Porto Rico and Virgin Is., 9, pts. 3, 4: 1–598, 1927), making a total of 52 species and subspecies.

An annotated list of the birds from Mona Island follows. The specimens collected by the writer are in his private collection, deposited at the Institute of Tropical Agriculture, University of Puerto Rico, Mayaguez, Puerto Rico.

I wish to express my gratitude to Dr. Alexander Wetmore, Secretary of the Smithsonian Institution, for his kindness in revising the manuscript.

Puffinus lherminieri lherminieri Lesson, AUDUBON'S SHEARWATER.—Observed on many occasions on the barren cliffs of the northern side of the island. On March 18, 1944, one followed our boat for more than three hours, giving opportunity for a positive identification.

Oceanodroma leucorhoa leucorhoa (Vieillot), LEACH'S PETREL.—Observed on waters adjacent to Mona, following the fishing boats. They are known by the fishermen as *Lavapiés* because of the peculiar habit of dipping in the waves as if they were "washing their feet."

Phaëthon lepturus catesbyi Brandt, YELLOW-BILLED TROPIC-BIRD.—One male collected at the barren cliff north of Sardinera Beach, May 4, 1944. A breeding colony was observed in the vicinity of Cueva del Capitán, on May 18, 1944, when many birds were recorded flying over the entrance of the large cave, and at short intervals entering and leaving. I could not reach the nesting site because of the steep cliffs.

Pelecanus occidentalis occidentalis Linnaeus, WEST INDIAN BROWN PELICAN.—One adult bird was observed at Sardinera Beach, May 12, 1943. Later, on April 4, 1944, another was recorded on a small beach east of La Esperanza on the northeast coast.

Sula leucogaster leucogaster (Boddaert), WHITE-BELLIED BOOBY.—Common, breeding on the northern cliffs of the island. A breeding colony was observed March 27, 1944, in a large cave known as El Toro, northwest of Sardinera Beach, on top of the limestone plateau. Eighty-seven nests were recorded scattered over the rocky floor and in the shallow crevices of the high walls. The nests contained eggs in different stages of incubation, and young of different ages. The parent birds were not much alarmed and some continued feeding the young while I sat quietly behind a huge piece of stalagmite. The larger young in the nests were constantly shaking their wings as though trying to fly. Some pushed themselves out of the nest for a few yards, but never missed their own particular nest when returning.

A male was collected off the coast at Uvero on March 10, 1943.

Sula sula sula Linnaeus, RED-FOOTED BOOBY.—A common resident along the coast. A male was collected off Sardinera Beach on October 21, 1941.

Fregata magnificens rothschildi Mathews, CARIBBEAN MAN-O'-WAR-BIRD.—A common resident around the coast, breeding in large colonies on top of the limestone plateau where I recorded a breeding group on March 4, 1943. It was located on a small area covered with low trees in the vicinity of Cueva del Gato. The nests were built on the forks of branches, and consisted of rough, shallow platforms with small depressions where a single, large, white egg was laid. Most of the nests (32 in number) contained eggs in different stages of incubation, and five held one young, each, not more than two or three days old. Next year (1944) they did not breed here, probably being frightened away by the laborers working on the meseta. One male was collected off Sardinera Beach on November 5, 1944.

Nyctanassa violacea violacea (Linnaeus), YELLOW-CROWNED NIGHT HERON.—Fairly common through the island. These herons remained in the thickest growths during

daytime and became active after nightfall. On November 5, 1944, an adult, too long dead to be saved, was brought by one of the fishermen, who call this species *Carrao*.

I never succeeded in finding a nest, although I found enlarged testes and ovaries in seven birds that were killed in June, 1944, by the fishermen who frequently killed these herons for food.

Anas discors Linnaeus, BLUE-WINGED TEAL.—Of accidental occurrence on the island. A male collected in the small mangrove swamp southeast of Sardinera Beach on November 5, 1944. This is the first record for the species on Mona Island.

Pandion haliaetus carolinensis (Gmelin), OSPREY.—One bird was observed perching on the highest branch of an almacigo (*Elaphrium simaruba*), east of Uvero Beach on the south coast on November 12, 1944.

Falco peregrinus anatum (Bonaparte), DUCK HAWK.—A winter migrant, recorded by Dr. Danforth from Uvero and Playa de Pájaro.

Falco sparverius dominicensis Gmelin, DOMINICAN SPARROW HAWK.—Not common but observed on several occasions through the coastal plain and on the limestone plateau. It is always found in pairs, male and female flying together. My specimens include a female collected at Sardinera Beach, October 21, 1941; two males at Uvero Beach, April 4, 1944; one male and one female on the coastal plain, March 23, 1944.

The stomach contents of these birds showed 100% animal matter, consisting of four small lizards, one small field rat, and the remains of a grasshopper and other insects I could not identify.

Porzana carolina (Linnaeus), SORA.—One female was collected in the small ciénaga east of Sardinera on November 5, 1944. This is an unusual record and is the first authentic report of the occurrence of this migrant. The bird's condition was very poor, as it was thin and emaciated.

Squatarola squatarola (Linnaeus), BLACK-BELLIED PLOVER.—Eleven were seen in a flock on the beach at Sardinera, and a male and a female collected on October 21, 1944. This constitutes the first authentic record of this species on Mona Island.

Charadrius vociferus rubidus (Riley), ANTILLEAN KILLDEER.—A male was collected at Uvero Beach, June 5, 1943, and one male obtained at Sardinera, June 5, 1944. These constitute the first records for Mona Island of this bird which appears not to breed here.

Arenaria interpres morinella (Linnaeus), RUDDY TURNSTONE.—Recorded by Dr. Danforth from Uvero Beach.

Actitis macularia (Linnaeus), SPOTTED SANDPIPER.—Large numbers of this species arrive on Monz during the season of migration, associated with other sandpipers. They are found particularly along the coast, from Sardinera to Uvero, and also at Playa de Pájaro. Recorded also from small pools formed by rain along the dirt road.

One female was collected on the beach east of Sardinera on November 2, 1943.

Tringa solitaria solitaria Wilson, EASTERN SOLITARY SANDPIPER.—A rather common winter migrant, found along the coast and sandy beaches. A male and female were collected on the swampy mangrove area east of Sardinera on Dec. 10, 1944.

Totanus melanoleucus (Gmelin), GREATER YELLOW-LEGS.—One male was collected at a small pond of rain water on the dirt road between Sardinera and Uvero, south coast of Mona Island, December 10, 1944; five were noted at Sardinera on November 10, 1944; two were recorded at Playa de Pájaro, east coast, on November 27, 1944.

Totanus flavipes (Gmelin), LESSER YELLOW-LEGS.—A common winter migrant. Twenty-two were recorded on the beach at Sardinera on November 10, 1944. One male was collected in the mangrove swamp east of Sardinera on December 10, 1944.

Erolia minutilla (Vieillot), LEAST SANDPIPER.—A common winter migrant, observed on several occasions along the sandy beaches of the south and southeast coasts. A male and a female were collected in the mangrove swamp area east of Sardinera, December 10, 1944.

Ereunetes pusillus (Linnaeus), SEMIPALMATED SANDPIPER.—A rather common winter migrant, found along the sandy beaches. On November 29, 1944, eighteen birds were seen on the beach at La Esperanza, northwest of Sardinera. One was observed at Uvero, December 8, 1944. A male was collected in the small swamp area east of Sardinera, November 5, 1944.

Crocethia alba (Pallas), SANDERLING.—An uncommon migrant. One male and two females, collected at Sardinera Beach on November 12, 1944, constitute the only records.

Larus atricilla Linnaeus, LAUGHING GULL.—Seen commonly along the coast. On April 4, 1944, an adult female was collected off Sardinera. Seven were noted at Uvero on July 8, 1944. I noticed many flying over large schools of tuna between Mona and Monito, associated with boobies and terns.

Sterna fuscata fuscata Linnaeus, EASTERN SOOTY TERN.—The Sooty Terns are rather common in the waters adjacent to Mona where I noticed them flying very low over large schools of tuna. I have never recorded them breeding on the island. One male was collected off the coast at Sardinera on April 4, 1944.

Sterna anaethetus melanoptera Swainson, BRIDLED TERN.—Common along the coast. A male was collected at Uvero on March 23, 1944.

Thalasseus maximus maximus (Boddaert), ROYAL TERN.—One male was collected at Playa de Pájaro, November 6, 1944. Three individuals were noted at Sardinera Beach, August 12, 1944; seven were observed at Uvero, flying low over the sea, on March 23, 1944.

Anous stolidus stolidus (Linnaeus), NODDY TERN.—Exceedingly abundant along the coast. A large breeding colony was found on June 12, 1943, on the abrupt cliffs of the plateau on the northern part of the island, on an inaccessible point of the meseta. This was close to Cueva del Toro. Another colony was found breeding at La Esperanza, May 23, 1944, where I could see the nests placed in crevices of the high cliffs. I was informed by the fishermen who had been for a long time on Mona, that the *Severo* used to breed on top of the plateau on the rocky floor of the meseta, and there is still a small trail called the Trail of Los Severos which leads from Sardinera to where this tern used to nest.

A male was collected off Uvero Beach on November 10, 1944.

Columba leucocephala Linnaeus, WHITE-CROWNED PIGEON.—Common on the island from May to August, in compact flocks both on the coastal plain and on the plateau. One female was collected in the Pine Growth on March 23, 1944. A male was obtained at Uvero, October 21, 1941.

Undoubtedly this pigeon comes from Hispaniola to breed on the island. I have witnessed the arrival of large, compact flocks approaching from the southeast, flying high over the channel in compact formation. They breed through the island, on top of the plateau and on the coastal plain. On occasions I have noted as many as eight nests on a single tree of the papayo (*Metopium toxiferum*). The nest consists of a rough, shallow platform, with a small depression that contains

two eggs of a brilliant white color. The nests are usually placed between upright forks and are built of coarse sticks, twigs, and dry leaves. On July 17, 1943, I observed eleven pairs breeding in tall casuarina pines on Sardinera. Flocks were seen feeding on the seeds of the cogollo palm (*Sabal causiarum*) in the vicinity of Uvero.

Stomach contents of 17 birds consisted of fruits of papayo and cogollo palm (*Sabal causiarum*), drupes of jaguey (*Ficus* sp.), and large red berries of the cerezo.

Columba squamosa Bonnaterre, SCALED PIGEON.—Found in limited numbers on the island, not as common as the preceding species. One male was collected at Sardinera on March 23, 1944, and another was obtained at Uvero on October 6, 1944. Apparently they breed here though I never succeeded in finding a nest.

The White-crowned and the Scaled Pigeons vanish from the island after August and do not appear again until the following March, when the first return. Stomachs examined showed the fruit of papayo.

Zenaida aurita zenaida (Bonaparte), ZENAIDA DOVE.—Rather common throughout the year. They are well distributed over the coastal plain and the limestone plateau where this is densely covered with shrubs. I noticed them breeding at different seasons. Nests were observed on August 28, 1943 (Uvero); December 6, 1944 (Uvero); January 21, 1944 (Los Cerezos, on the plateau); February 9, 1944 (Pine Growth); February 11, 1944 (Sardinera); February 16, 1944 (Palmar de Cogollo); March 21, 1944 (in the vicinity of Cueva del Gato, on the plateau). From May to August they are associated in flocks of 30 birds or so feeding in the sandy areas of the coastal plain around Uvero and Caigo o no Caigo.

Stomachs of 21 examples showed small seeds of leguminous plants, 102 papayo drupes, seeds of cardosanto (*Argemone mexicana*), 57 fruits of almacigo (*Elaphrium simaruba*), and particles of sand.

A male was collected on March 22, 1944, at Sardinera Beach; one male was obtained at Uvero on March 23, 1944; one female was killed on the plateau in the proximity of Cueva del Gato on March 24, 1944.

Zenaida asiatica asiatica (Linnaeus), WHITE-WINGED DOVE.—One female and two males were collected on May 4, 1944, at Uvero Beach, south coast, from a small flock of about 30 birds observed feeding in the dry, cactus-covered area close to the sandy beach. They remained on the island until about the first of June. On my next trip to the island (June 7), I succeeded in collecting a female. The flock recorded on May 4 may have been in flight to the southwestern littoral of the main island of Puerto Rico, the only point on the island where they are found, as far as I am aware.

The stomach contents revealed the presence of seeds of leguminous plants and of cardosanto (*Argemone mexicana*).

Columbigallina passerina exigua (Riley), MONA ISLAND GROUND DOVE.—Common and well distributed through the coastal plain and on the meseta. Three males were collected at Sardinera on March 22, 1944; three females were obtained at Uvero on March 22, 1944; three males and two females were collected on the extreme north end of the plateau on March 23, 1944; one male was killed and preserved on March 24, 1944, near Los Cerezos, where it was found to be exceedingly abundant. I noticed flocks of a hundred or more birds in the Pine Growth at Sardinera. Through the coastal plain they are generally found in large parties, feeding in the extensive cactus association. At Uvero, on October 6, 1944, 300 were noticed frequenting a small water hole from 7:30 to 11:00 A. M.

These birds breed in low bushes and in thick patches of shrubs. On different occasions nests were found placed on the ground, well concealed by the high grass. The nest consists of a small, shallow, cup-shaped platform with a deep depression where two white eggs are deposited. I found nests on May 11, 1944, at Sardinera, built in the thick bushes close to the cliff; at Uvero Beach, June 2, 1944; at Cueva del Gato on June 8, 1944; and two nests with young on a low bush on the trail to Los Cerezos, June 28, 1944. A nest containing two eggs was found concealed by grass in the middle of the dirt road, May 17, 1944. The incubating bird flushed when I approached.

Stomach contents were seeds of different leguminous plants and of cardosanto (*Argemone mexicana*), also particles of sand.

Oreopeleia chrysia (Bonaparte), KEY WEST QUAIL-DOVE.—Included by Dr. Wetmore from Mona on the basis of sight records by Bowdish, who claims he saw this species on several occasions. Probably now extirpated.

Oreopeleia montana montana (Linnaeus), RUDDY QUAIL-DOVE.—Cited by Dr. Wetmore from specimens collected by Mr. Bowdish, who found this species abundant from August 9 to 21, 1901. Probably now extirpated on the island.

Aratinga chloroptera maugei (Souancé), PUERTO RICAN PAROQUET.—Cited by Dr. Wetmore from Mona Island based on specimens collected on the island. Now extirpated.

Coccyzus minor teres Peters, MANGROVE CUCKOO.—Locally fairly common in areas well covered with shrubs and thick, low bushes. One male was collected at Sardinera, October 21, 1941; one male and two females were taken at Palmar de Cogollo on April 4, 1944; a female was obtained at Sardinera, March 23, 1944.

Stomach contents showed remains of several insects not identified except that elytra of beetles were noticed.

Coccyzus americanus americanus (Linnaeus), YELLOW-BILLED CUCKOO.—This winter migrant was cited by Dr. Wetmore from Mona Island based on an adult bird shot by Bowdish on August 17, 1901.

Crotophaga ani Linnaeus, SMOOTH-BILLED ANI.—A small flock was recorded, consisting of 27 birds, usually met with on the coastal plain, and never found on top of the limestone plateau. The Ani seems to be restricted to the lowlands of the coastal plain, ranging through the thick bushes and on the tall Guinea grass (*Panicum maximum*).

A nest was recorded on September 10, 1944, placed in an almacigo about 11 feet from the ground at the extreme end of a main branch. It contained 14 fresh eggs, of a blue color, placed in layers of five. None of the birds was seen in the vicinity of the nest. Six days later the nest was still in the tree, but was empty.

One male was collected on April 5, 1944, southeast of Sardinera at the edge of the dirt road.

Megaceryle alcyon alcyon (Linnaeus), EASTERN BELTED KINGFISHER.—Uncommon winter migrant. A male was collected April 6, 1944, at Sardinera.

Tyrannus dominicensis dominicensis (Gmelin), GRAY KINGBIRD.—A rather common resident, well distributed throughout the coastal plain and on the limestone plateau. One male was collected at Sardinera Beach in the Pine Growth, October 21, 1941. A female was collected in the arid scrub at sea level on March 23, 1944; one male and one female were obtained at Uvero Beach, April 5, 1944.

A nest with two eggs was found on a branch of a papayo (*Metopium toxiferum*) at the edge of the dirt road, about ten feet from the ground. Both birds were about when I climbed to look at it on May 13, 1944.

Tolmarchus taylori (Vieillot), PUERTO RICAN PETCHARY—Cited by Dr. Wetmore from Mona Island on the basis of reports obtained by Struthers in 1921. I have never recorded the species here.

Progne dominicensis (Gmelin), CARIBBEAN MARTIN.—Reported by Dr. Wetmore from Mona Island from the records of Bowdish who found this species common during his stay in August, 1901. I did not observe it during my survey.

Margarops fuscatus fuscatus (Vieillot), PEARLY-EYED THRASHER.—A very common resident, widely distributed on the coastal plain and on the limestone plateau, always met with in small groups of trees and in thick bushes, and common around the camp at Sardinera. This is the most abundant land bird on the island. It seems to breed throughout the year according to my records of nests with eggs or young.

The nest is a bulky, rough structure, built with coarse pieces of sticks, grass, and other vegetable matter. It is usually located inside caves or in deep crevices on the cliffs. Twenty-seven nests all contained sets of two eggs each, of a creamy-white color, speckled with deep brown over the entire surface. Of these nests, nine were found from May 3 to 28, four in June, and fourteen at other seasons.

A male was collected at Sardinera Beach on November 12, 1943. Two males with enlarged testes were collected at Uvero on May 21, 1944.

This thrasher feeds mainly on fruits, but also on insects, spiders, and other arthropods. On several occasions I verified that it ate the eggs and young of the White-headed Pigeon, the Zenaida Dove, and the Ground Dove. No matter how well concealed the nests are, the thrasher always discovers them.

One of the fishermen established in a small cabin at Uvero Beach, where these thrashers were particularly abundant, caught them in a rat trap baited with ripe papaya (*Carica papaya*).

At the close of day, males sing their melancholy songs until the sun is down. Before sunrise, when it is still dark, the song is heard constantly around the camp at Sardinera.

Mniotilta varia (Linnaeus), BLACK AND WHITE WARBLER.—A common winter migrant. One male was collected on the plateau at Los Cerezos, October 6, 1944.

Compsothlypis americana pusilla (Wilson), NORTHERN PARULA WARBLER.—An uncommon winter migrant. One male was collected at Uvero Beach on the south coast on April 19, 1944.

Dendroica coronata coronata (Linnaeus), MYRTLE WARBLER.—A rather common winter migrant. One male and two females were collected in the Pine Growth, east of Sardinera, on March 24, 1944. Another male was taken at Uvero Beach on April 4, 1944.

Dendroica dominica dominica (Linnaeus), YELLOW-THROATED WARBLER.—An uncommon winter migrant. One male was collected at Uvero Beach, on the south coast, on October 5, 1944.

Dendroica discolor discolor (Vieillot), NORTHERN PRAIRIE WARBLER.—A fairly common winter migrant, well distributed through the Pine Growth and the coastal plain. Two males and one female were collected in the Pine Growth east of Sardinera on March 23, 1944; two males were taken at Uvero Beach, October 5, 1944; one male was collected at Sardinera Beach, November 12, 1944.

Dendroica palmarum palmarum (Gmelin), WESTERN PALM WARBLER.—An uncommon winter migrant, recorded from the Pine Growth east of Sardinera Beach, where a male and female were collected on October 26, 1944.

Seiurus aurocapillus aurocapillus (Linnaeus), OVEN-BIRD.—Not common. A male was collected in the Pine Growth on April 4, 1944.

Seiurus noveboracensis noveboracensis (Gmelin), NORTHERN WATER-THRUSH.—The only bird of this species that I observed on the island was a male collected on March 24, 1944, in the Pine Growth east of Sardinera Beach, while it was feeding around an abandoned water hole under the casuarinas.

Seiurus motacilla (Vieillot), LOUISIANA WATER-THRUSH.—Recorded by Dr. Wetmore from specimens collected by Bowdish on August 18, 1901.

Setophaga ruticilla (Linnaeus), REDSTART.—A rather common winter migrant through the Pine Growth and the coastal plain. A female was collected at Uvero Beach on April 4, 1944.

Agelaius xanthomus monensis Barnés, MONA ISLAND BLACKBIRD.—Moderately common and restricted to the limestone plateau where it feeds in the cactus association and gathers in small flocks of ten to twelve birds. It has never been recorded from the Pine Growth or from the coastal plain.

The breeding season is in July and August. I have recorded seven nests, built on tall cacti (*Selenicerus* sp.). Two nests found on July 9, 1944, contained sets of four eggs each in an advanced stage of incubation. Five nests found later on July 27, contained four eggs each. The nest is a global structure, somewhat elongated, built of dry grass, small twigs, and other vegetable matter. Both parent birds remain close to the nest during the breeding period and are not easily alarmed. After the young leave the nests they gather in small parties.

One male and one female with testes and ovaries enlarged were collected on March 23, 1944, on the northwestern side of the plateau; two males were taken at Cueva del Gato, on the plateau, April 5, 1944; two males at Las Caobas, on the plateau, April 6, 1944; one male and one female at Cueva del Capitán, on the plateau, April 7, 1944; two males, one female, and one (?) at the north end of the plateau, October 6, 1944.

Piranga olivacea (Gmelin), SCARLET TANAGER.—A rare winter migrant. One male was collected at Palmar de Cogollo, northeast of Uvero Beach, May 3, 1944. This is the first record of the species.

Division of Fisheries and Wildlife
Department of Agriculture and Commerce
Mayaguez, Puerto Rico

LIFE HISTORY OF THE COSTA RICAN TITYRA

BY ALEXANDER F. SKUTCH

THE Costa Rican Tityra (*Tityra semifasciata costaricensis*) is a member of the Cotingidae, a large and heterogeneous family of arboreal birds, related to the Tyrannidae or American flycatchers, and confined to the warmer parts of the Western Hemisphere, including the Antilles. Very few species extend beyond the Tropics; only one, Xantus's Becard, reaches the southern boundary of the United States. Of very small to medium size (for passerine birds), the cotingas are for the most part clad in browns and grays, but some

are of most unusual and striking coloration. A number of species are predominantly white in plumage; a few almost wholly of this color, so rare among forest birds. Others are of the most brilliant and intense blue, with patches of rich purple on the under parts; still others are largely black. Long fleshy wattles, areas of brightly colored bare skin, and crests of curving plumes—ornaments so rare among the passerine birds of the Americas—are not uncommon in this wonderful family, to which belong the bell-birds, the umbrella-birds and the fruit crows.

In the high rain-forests where the majority of cotingas are found, these birds of the tree-tops are a standing—and largely unanswered—challenge to the bird-watcher. Their calls, now sharp and shrill, now sweetly soft, now of a most un-birdlike, mechanical quality, are among the characteristic sounds of the woodland. But one may hear these cries day after day for months and months before he succeeds in tracing them to their source amid the clouds of verdure so high overhead. Finding the nests, and learning something of the breeding habits, of these denizens of a world above and largely out of reach of our own, is the ornithologist's despair. In the forests over which I look as I write, *Lathria unirufa* is an abundant bird. One can hardly make a sudden loud noise of any kind without eliciting the sharp whistles of this bright brown, thrush-like citizen of the tree-tops; yet during eight nesting seasons I have looked in vain for its nest. On the other hand, the great globular nests of the becards (genera *Pachyramphus* and *Platypsaris*), built of vegetable materials in the tops of the scattered trees of the clearings and more open country where many species of this group of cotingas dwell, are often not difficult to find, although nearly always impossible to reach. Of the breeding habits of becards we have several more or less complete accounts (Gosse, 1847; Bent, 1942). Chapman (1929) studied the nesting of Natterer's Cotinga. But for the most part we have only scattered, fragmentary notes on the habits of the cotingas—isolated islets and reefs lost in the vast sea of our ignorance of this family which is in many respects the most remarkable and interesting group of exclusively neotropical birds.

APPEARANCE AND HABITS

In plumage, in voice, in mannerisms, the Costa Rican Tityra is one of the most distinctive of Central American birds—an original avian character. At the first glimpse of a male tityra winging overhead, one exclaims: "The little white bird!" Predominantly white plumage, so common among waterfowl and birds of Arctic regions,

is rare among forest birds and in itself a mark of distinction. Closer scrutiny of the tityra reveals that his plumage is not so white as it appears when he flies overhead; a formal description of the bird fails to convey an adequate conception of his whiteness when viewed when the bird is in flight or resting in the tree-top. His upper plumage is pale bluish-gray, becoming almost white on the back of the head; his under plumage approaches still more closely to white. His wings are largely black; his tail pale gray with a broad black band covering the terminal third and a narrow whitish border across the end. His dark eyes are surrounded by a broad area of bright red bare skin, covering the lores; and this is margined all around by black feathers, which form a narrow fringe across the chin and a broad band on the forehead. His short, stout bill is red over the basal half, black on the end. The upper mandible is terminated by a short, down-curved hook. The tityra is about the size of a Rose-breasted Grosbeak, but even stockier in build, with a shorter tail.[1]

The female tityra is far less white than the male, for her plumage is distinctly brownish-gray above, and light gray below. The bare skin of her cheeks is a paler red than that of the male. The two sexes are nearly equal in size.

The voice of the tityra is like that of no other feathered creature that I know, and is distinctly un-birdlike. To call it a very low grunt conveys only an approximate notion of its quality. It has been compared to the grunting of a pig, but the pig's notes are deeper, fuller and usually louder. At other times the tityra's notes incline more toward a dry, insect-like character. To appreciate their odd quality, one must hear them; and then there is little likelihood that the bird-lover will ever confuse the calls of the tityra with those of any other bird. It has an extremely limited vocabulary, and if it possesses any softer or more melodious notes, during a dozen years in its haunts, I have failed to overhear them.

One is not likely to confuse the Costa Rican Tityra with any other bird of Central America. The Snowy Cotingas (*Carpodectes*) are tree-top birds of about the same size and the same general aspect, but they are even whiter, lacking the black trimmings on head, wings and tail, and the bare red cheeks. Fraser's Tityra (*T. inquisitor fraserii*) bears a still closer resemblance to the subject of this study, but is readily distinguished by the absence of bare red cheeks. In flight, the wing of Fraser's Tityra shows a small white area, like a 'window,' in the midst of the black, which is lacking on the Costa

[1] A colored portrait of another race of *Tityra semifasciata*, by George Miksch Sutton, was published as the frontispiece of Volume 59 of The Auk, January, 1942.

Rican Tityra. This bird's notes are somewhat similar to those of the Costa Rican Tityra, but are drier and less 'grunty,' readily distinguished after they have been heard.

The tityras are at home among the tops of the big forest trees, where earth-bound man hears far more often than he sees them. But they often make excursions, in pairs or small flocks, through clearings and plantations with scattered tall trees, and they commonly nest in dead trees standing isolated near the edge of the forest. Almost always they prefer to fly and forage at a good height above the ground. They are restless, wandering birds, except while bound to a nest appearing seldom to remain long in one locality. Like other cotingas, while perching quietly they turn their heads from side to side, scrutinizing the surrounding foliage until they espy an edible insect, then make a sudden dart to snatch it from the foliage. The first tityra I ever saw held a fleet-winged dragonfly in its bill, but I do not know whether this was captured while flying or at rest. They eat also berries and other small fruits of trees.

The tityras appear to remain mated through the year, for I have a number of times seen them in pairs even during the autumn. Yet at all seasons, even during the nesting period, one occasionally meets small, wandering flocks composed largely of males, which seem to be considerably more numerous than the females. After pairing, the male tityra is ever a faithful companion of his mate, and seems to subject himself to her will. Late one cloudy afternoon in early March, I found a pair of these birds resting among the dead trees of a clearing at the edge of the woods, where they were preparing to nest. The male seemed to be in a hurry to go to their roosting place in the neighboring forest, and twice flew across the clearing to a tree at its border, where he called in his queer grunty voice and waited for his mate to follow. Since she was not yet ready to depart, he returned each time to await her pleasure. Soon, however, she yielded to his entreaties, and the pair winged away over the forest together.

Tityra semifasciata ranges over a vast territory, from southern Brazil to México, and several geographic races have been recognized. Over much of this area, it is one of the first members of the cotinga family that the visiting naturalist is likely to meet. Tolerant of varied ecological conditions, it is at home not only in the most humid rainforests but also in semi-arid areas with scattered trees. In Central America it is widespread over the lowlands of both coasts, and ranges far up into the mountains. On the Pacific side of the Cordillera de Talamanca, in late February, I found it nearly 7,000 feet above sea-

level, but am not sure whether it nests so high. I found it nesting at 5,500 feet at Vara Blanca on the northern side of the Cordillera Central of Costa Rica. But in this extremely wet region I failed to see the bird during the period from August to late February, which suggests that it might perform a slight altitudinal migration, dropping down to lower levels after the close of the nesting season, ascending the mountains again as the time for nest-building nears.

NEST-SITE

The Costa Rican Tityra nearly always nests in cavities in dead or, more rarely, living trees, usually between 40 and 100 feet above the ground. One female was seen carrying material into a hole only 20 feet up, in a slender stub standing in a clearing; but this exceptionally low nest was apparently never used. Either cavities resulting from decay or those made by woodpeckers are acceptable to the tityras, but the latter seem to be preferred, especially the chambers carved by species of *Centurus, Tripsurus* and others of the smaller woodpeckers, whose doorways are barely wide enough for the tityra to pass through. They not infrequently capture holes still used by the woodpeckers for sleeping, or even those newly completed for the accommodation of the woodpeckers' eggs and family, dispossessing the hole-carvers by persistence rather than by violence, in a manner which we shall consider later. I have not known them to oust the woodpeckers from holes that actually contained eggs or nestlings. The tityra's nest high in a rotting trunk of uncertain strength is best left unvisited by a man with even a moderate regard for the integrity of his bones. Once, when enthusiasm overruled judgment, I did look into a tityra's nest; but I should not repeat that climb, nor advise anyone else, not a member of a suicide club, to attempt it.

In 1939, I was surprised to find tityras nesting in the crowns of three palms (*Attalea* or some feather palm of very similar aspect) standing not far apart in a cleared valley, with forest near by. The three nests were placed in deep crannies between the crowded, massive, fiber-swathed bases of the great leaf-stalks, at heights ranging from 40 to 75 feet above the ground. Two were among the living fronds in the spreading crowns of the stately palm trees, the third among the stumps of fallen fronds at the base of the crown. That this sort of nest-site was not unwelcome to the tityras was indicated by the fact that each of the three palm trees—the only ones of the kind in sight—sheltered a nest. Each palm tree seemed to offer potential sites for a large number of nests, but the tityras' territorial habits prevented their fuller utilization. Except in this one spot in

the upper Térraba Valley of Costa Rica, I have never found the tityras nesting elsewhere than in cavities in trees. All of the nests that I have seen were in clearings near the forest.

NEST-BUILDING

Long before the approach of the breeding season, the tityras, as they roam in pairs through the forest and adjacent clearings, begin to examine woodpeckers' holes and other cavities in trees which might later serve them as nest-sites. I have watched them pursue these investigations as early as November; indeed, at all times of the year, they manifest a curiosity in the holes in trees that they encounter on their wanderings. The female goes to the doorway of the hole and looks in, while her mate, who follows her like a shadow, clings to some neighboring part of the trunk, with black-and-white wings prettily half-spread. Often he goes to the doorway, too, after his mate has completed her inspection. It is usually not until a later date that the birds actually enter the holes.

At times it appears that the examination of possible nest-sites may be made before the pair has been formed, or at least before the rivals of the successful male have become discouraged and given up their suit. On February 20, 1938, I saw tityras at Vara Blanca, Costa Rica, for the first time in half a year. The following morning, I found several of these birds in the vicinity of a dead trunk, standing in a narrow clearing amidst the forest on the mountain-side at 5,300 feet above sea-level, where a pair had nested the preceding July. When their voices first called my attention to their presence, I saw one female followed by three males. The female flew around from one to another of the dead trunks standing in the pasture, looking into the many old woodpecker holes that they contained; and the males followed her, sometimes peering into the cavities, too. They uttered their little thick notes, flitted their black-and-white tails fanwise, and sometimes one flew toward another; but the bird that was approached always promptly retreated; and there was no fighting, nor any suggestion thereof. After the female had made the rounds of the decaying trunks, she flew down the mountain again, followed by her three ardent swains.

This observation suggests that the tityra's method of mating and establishing a breeding territory is very different from that of finches and other song-birds, among which the male settles in an area, advertises his presence by singing, and awaits the arrival of a mate. The female tityra appeared to select the territory while the males followed her about, awaiting her decision. I should have given much

to learn how she made her choice between the three rivals; but since it was quite impossible for an earth-bound bird-watcher to follow the birds over the tree-tops, the courtship was performed largely beyond my ken. As late as March 6, there were three tityras in this clearing; but by the following day another of the males had been eliminated. The female's choice of a mate seemed to have been definitely made. But she was not seen building until April 3.

At lower altitudes in Costa Rica (2,000–3,000 feet), I have known the tityra to begin nest-building as early as the end of February, at the height of the dry season. March and April are the months of greatest activity in nest-building in Costa Rica. Tityras may often be seen taking material into holes in May, but this is probably in preparation for second broods, or to replace first nests that had been destroyed.

Like many other birds, the tityras, especially the female, may gather material some time before they actually begin to build, carry it in their bills a while, then drop it to the ground. In 1937, a pair of tityras was much interested in the still-occupied dormitory of a pair of Golden-naped Woodpeckers (*Tripsurus chrysauchen*) in a clearing at the edge of the forest. I first saw the female with material in her bill on February 20, but it was March 2 before I witnessed her actually take anything into the hole that she had chosen for her nest. Yet two days later I found her resting on top of the stub that contained the hole, with dead leaves in her bill. After I had watched her perch motionless here for twelve minutes, she suddenly let them all drop to the ground. During the period while the female tityra was gradually working herself up to the point of beginning to build, her mate seemed most eager to have her proceed with the work. Often, while she paused irresolutely in a neighboring tree, holding a twiglet or a dead leaf in her bill, he would go to the woodpeckers' hole and cling to the doorway, at times flying off a little way and then returning, as though to encourage her to take the stuff inside. Even when she was not in sight, he might go to look into the prospective nest-cavity, at times during the warmest hours of the afternoon.

For the Costa Rican Tityra, nest-building is a simple matter, consisting merely in filling up the bottom of the chosen cavity with a loose litter of small dead leaves, or pieces an inch or two across torn from bigger ones, fine dry inflorescences of trees, fine twiglets, and rarely a small green leaf. This work is done chiefly or wholly by the female, while her mate, as a rule, follows her faithfully back and

forth, and often goes to look into the cavity. The material for the nest is plucked from the tree-tops rather than gathered up from the ground—I have never seen a tityra on the ground or even very near it. She, as a rule, works in a desultory fashion, taking a few billfuls into the hole, then going off and remaining out of sight until the watcher wearies of waiting for her return. The male frequently carries material in his bill, often takes it to the doorway of the cavity; but rarely does any of the stuff he so assiduously carries find its way into the nest.

The male tityra's efforts to be helpful while his mate builds are most amusing to watch. One morning a male brought a piece of dead leaf to the woodpecker hole in which his mate was building, clung to the doorway, looked around for his absent partner, then flew up to the top of the trunk and waited, still holding the bit of leaf. After a few minutes he dropped down to the doorway, looked about him while he lingered there, and again flew up to the top of the trunk with the leaf still in his bill. Four times he took the piece of leaf to the doorway, and four times he carried it away again. The last time, he flew to a neighboring tree and dropped it. All this while his mate remained out of sight. I saw another male take material to the nest-tree on three separate occasions. The first time, he came alone, and when he saw that his mate had not followed, flew off in search of her still bearing the twiglet. The second time, he followed her to the nest-tree, clung to the top while she entered, then when she left flew away with her, still carrying what he had brought in his bill. The third time, he also came with his mate, again with a small twig in his bill, while she brought a number of pieces of dead leaves. While she was within, he came to cling at the entrance with his slight burden, as though to pass it in to her, but carelessly allowed it to drop to the ground. A boy who was cleaning the pasture near this nest told me that he saw the male give his mate what he had brought, outside the cavity, and she took it inside. I have never, myself, witnessed such a transfer of material among tityras; but it certainly is not impossible. The lad was not a trained observer, but since other things he reported to me proved his careful attention, I think this observation worth recording here.

Long acquaintance with the male tityra has convinced me that he is a courteous and peace-loving gentleman, a good father and a most devoted husband. He tries on all occasions to be helpful to his wife; but the goodness of his heart is frequently frustrated by the dullness of his wits.

The male Fraser's Tityra has a similar habit of bearing pieces of

material back and forth from the nest without taking them inside. I have seen him carry the same dead leaf to and from the nest ten times, following his mate as she filled the nest-cavity. Only exceptionally, almost accidentally, does he ever actually push anything through the doorway. The male Boat-billed Flycatcher (*Megarhynchus pitangua*) has the same habit of carrying material back and forth as he follows his building mate, but I have never seen him make an actual contribution to the nest. The male Rose-throated Becard (*Platypsaris aglaiae*) takes a large share in building the great, globular, pendent nest; but at a nest of the Cinnamon Becard (*Pachyramphus cinnamomeus*) and at several nests of the Slate-bellied Becard (*P. polychopterus similis*), the males, although attentive to their mates, made no contribution to the construction.

THE NEST EXAMINED: THE EGGS

The only tityra's nest that I have ever plucked up courage to reach was situated in the top of a massive dead trunk, standing in the cove in front of the laboratory clearing on Barro Colorado Island in Gatún Lake, Canal Zone. The trunk, a remnant of the forest that was inundated and killed when Gatún Dam was closed to impound the waters of the Río Chagres in 1914, rose about 35 feet above the water and was a hundred yards from the nearest shore. It was only the reflection that, if the trunk fell, the water would receive me more gently than solid ground, that nerved me to attempt the ascent; actually it was an exceedingly foolhardy thing to do. From a cayuco carved from a solid trunk, we threw a cord over the broad top of the thick stub. With this we pulled over a stouter rope, and with the rope we drew up a rope-ladder. The top of the stub was badly decayed, and the rope cut deeply into the rotten wood, making it stick, so that we experienced much difficulty in hauling up the heavy ladder. Our tugging dislodged chunks and fragments of the punky wood, which fell all about us in the dugout canoe. At length, however, we hoisted the ladder to the top, and made it fast by tying the thick rope to the base of a neighboring smaller stump, also projecting above the water. Since all of these trees had been dead about twenty years, one can imagine their state of decay—also the enduring qualities of some of the more resistant of tropical timbers.

By the time everything was in readiness for the ascent, the sight of so much rotten wood caused my resolution to waver; but my helper urged me on and I was ashamed to turn back. As I neared the top of the rope-ladder, I found the trunk in such an advanced stage of decay that I was fearful lest the whole upper portion should crumble

and drop me and all the birds' nests it contained into the water. On the way up I passed a large cavity, entered through an old woodpeckers' hole that sheltered two nestlings of the Blue-headed Parrot (*Pionus menstruus*), well grown but still naked and ugly. A pair of Noble Flycatchers (*Myiodynastes maculatus nobilis*) were feeding nestlings in a lower cavity; and a Black-winged Palm Tanager (*Thraupis palmarum atripennis*) had newly hatched nestlings in a well-made nest in a cranny at the very top, close to the tityra's nest. The supporting rope had passed over the top of the stub quite near the nest of the tityra. If it had chanced to rest a foot farther to the right, it would have broken through into the nest-cavity and destroyed it. This was in a most unusual situation, quite different from that of any other tityra's nest I have ever seen. In the upper side of the short stub of an obliquely ascending thick branch was an irregular hollow, apparently made by decay, a foot deep and wide enough readily to admit my hand. Although the opening was at the top, the cavity descended slantingly into the wood, and so gave the bird protection from the sun and at least the direct fall of rain. A loose litter of fragments, an inch or two across, torn from dead leaves, with a few pieces of leaf still green, filled the bottom of the hollow. Upon first peering in, I could see no eggs; but feeling amongst the litter of leaves, my fingers encountered two.

These eggs were dark buff or, better, the color of coffee with milk, heavily marbled, especially on the thicker end, with brown. A few small, scattered, black spots completed their decoration. They measured 30.2 by 20.6 and 29.8 by 21.4 millimeters. These are the only authentic eggs of the tityra of which I can find a record. Pure white eggs taken from an unlined cavity and ascribed to the tityra, beyond doubt belonged to some other bird, probably to the woodpeckers whose hole the tityras were investigating when shot by the collector.

INCUBATION

The female tityra alone incubates the eggs. Information on this point is available for a number of nests in Costa Rica and Panamá, and is corroborated by extended observations on one or more nests of Fraser's Tityra, the Slate-bellied Becard, the Cinnamon Becard, and the Rose-throated Becard. In none of these cotingas does the male share the labor of incubation, although he does feed the nestlings.

Before she begins to incubate, the female tityra may sometimes be seen resting in her high doorway, looking out upon the world. At times she will dart out as though to fly away, but within a few inches of the entrance turn in the air and go in again at once. Her mate

may remain perching in a neighboring tree, from time to time going to cling in front of the doorway and look in at her. As the day ends, the female, often in company with her mate, lingers near the nest cavity, guarding it; but in the waning light both fly off together to sleep in the neighboring forest. At a slightly later period, the male will depart first, leaving his mate perching alone near the nest. As the twilight deepens she may fly toward the doorway, only to turn back when in front of it, often repeating this move a number of times, but in the end losing courage or changing her mind, and winging away through the dusk in search of her mate. Such vacillating behavior is especially likely to occur if, as often happens, a family of great-billed araçari toucans sleep in a neighboring hole—but we shall have more to say of this in the section which treats of the relations of the tityra with other birds. At daybreak, male and female tityra often fly together from the adjoining forest to perch for a while near the nest, before the woodpeckers, which also sleep in a near-by cavity, have left their dormitory.

Apparently the filling of the nest-hole with loose litter may be practically completed for a considerable period before the eggs are laid, but during the intervening days the female tityra brings an occasional billful of dry leaves to the nest. The inaccessibility of tityras' nests makes it difficult to determine when the set of eggs is completed, and how soon after this incubation begins. But observations on the vacillating conduct at nightfall of female tityras that are on the point of beginning to incubate, make it appear likely that there is a certain amount of individual variation in the time, in relation to the deposition of the last egg, when they begin to sleep in the nest.

My most extended record of the behavior of an incubating female tityra was made at the nest in the rotting stub in Gatún Lake, from an open cayuco tied to a neighboring lower stub. Although I sat in plain view of the nest, the tityras appeared to take no notice of my presence. I watched this nest from 6:00 to 11:23 A. M. on May 29, 1935, and from 2:00 to 6:45 P. M. on the following day. During the ten hours, the female's sessions on the eggs ranged from 24 to 49 minutes, with an average, for eight sessions, of 37.1 minutes. Her recesses varied from 13 to 29 minutes, with an average, for nine absences, of 19.6 minutes. She spent 65.4 per cent of the time in the nest—a poor record of assiduity for so large a bird, but matched by that of a Fraser's Tityra which during six hours spent only 63.1 per cent of the time on her eggs. Becards in their bulky nests, which

must be hot and stuffy inside, sit even less constantly. During 20 hours, a Rose-throated Becard incubated only 56.3 per cent of the time. A short record of three hours for the Cinnamon Becard showed that she incubated only 47.6 per cent of the period.

Upon leaving her eggs, the tityra would emerge from the cavity and hop along the broad top of the stump to its highest point, where she would usually stand for several minutes, preening her feathers, stretching her wings, or only idly looking around, before she took flight for the wooded shore. Once she emerged from the cavity and spent six minutes resting and preening here, then returned to her eggs without going ashore. (In making the foregoing calculations, I did not count this brief intermission as a recess.) Upon returning from her outing, she would alight upon the same point and linger here for a minute or two before hopping down into the cavity.

It was remarkable how often the male tityra, watching from the neighboring forest, saw his mate before she reached the shore. Sometimes he flew out a short distance over the water to meet her. Then, together, they vanished above the tree-tops. On five of her ten returns to the nest, the female was escorted by her mate to the decaying stub standing in the water. He would rest for a minute or more atop the trunk near the doorway, before winging back to the shore. Once as she was returning alone to the nest, the female tityra was attacked above the water by one of the Noble Flycatchers which were feeding nestlings in the same trunk. The flycatcher plucked at her feathers, causing her to cry out in alarm or pain. But as soon as she alighted on the stub, the Noble Flycatcher ceased this ignoble conduct and left her in peace. She promptly returned to the shore, as though for the consolation of her mate, which a minute later saw her safely back to the nest. On another occasion, one of the flycatchers darted at the male tityra as he rested on top of the stub near his own nest, causing him to retreat to the shore. But aside from these two incidents, the tityras, the Noble Flycatchers and the Palm Tanagers nesting in the stub got along very well together. As to the Blue-headed Parrots, as long as I watched they remained in the distant forest, quite neglecting their two nestlings.

This male tityra was typical of his kind. As a rule they are most attentive to their incubating partners, watching from a neighboring elevated perch for their emergence from the nest, and now and again going to the doorway to peer in.

From time to time the female tityra, returning to her eggs, would bring a billful of leaves to the nest. I have seen this also at other

nests of the tityra, sometimes even after the eggs had hatched. The becards, which construct great bulky nests, and numerous other birds whose nests are very big or elaborate, or mere loose piles of litter like that of the tityra, continue to bring more or less material to them during the period of incubation.

Since upon my first venturesome climb to the tityra's nest I suffered no mishap, I went up twice more, and each time found the eggs completely buried and covered over in the leaf-litter. It would be interesting to know how this was accomplished. Possibly the female sat so deeply embedded in the leaves that when she rose to leave the nest they merely fell into the depression she had occupied, and so were buried with no effort on her part. Possibly, too, she was more actively responsible for covering them. This is a question which it was quite impossible to settle by direct observation. In the only other accessible nest of any member of the cotinga family that I have ever found, one belonging to a Slate-bellied Becard, the eggs were also more or less covered with loose leaves during the absences of the female. The habit of concealing the eggs beneath loose material upon the departure of the parents from the nest is far less frequent among passerine birds than one would suppose it might be because of its protective value. Aside from the dendrocinclas (*Dendrocolaptidae*), I know no other passerines that habitually do this; but among grebes, ducks, geese, partridges, sand-grouse, and a few other non-passerines, it is a not uncommon practice. The protectively colored eggs of the tityra, buried in the deep litter that covers the bottom of the dark nest cavity, must often escape toucans and other predators that come in search of them—or have these egg-eaters caught on to the trick?

In the middle of the afternoon, while the female tityra stood atop the trunk beside the nest, preening her feathers, her mate flew across the water with a big green caterpillar in his bill, and alighted close beside her. Without offering the food to her, he hopped to the rim of the nest-cavity and looked down into it. Evidently he had brought the caterpillar in expectation of finding nestlings to which he could give it, for upon seeing that the eggs were still unhatched, he swallowed it himself. The male tityra not infrequently brings food to the nest in this anticipatory fashion, finds that there are still no young mouths to receive it, then eats it himself or carries it off again. At a nest near Vara Blanca in the Costa Rican highlands, I saw the male do so twice. Since the male tityra has never been known to pass food to his mate, not even while they are attending nestlings,

these morsels were obviously not intended for her. Similar anticipatory food-bringing has been witnessed at nests of numerous other passerine birds, especially wood warblers and tanagers. It serves to form in the male parent, when he does not incubate, the habit of bringing food to the nest in advance of the hatching of the nestlings, with the result that after these escape the shells he will promptly find and attend them.

The incubation period of the tityra is unknown. The only cotinga whose incubation period I have been able to determine is the Slate-bellied Becard (*Pachyramphus polychopterus similis*). The eggs of this smaller bird hatch in 18 or 19 days, and the incubation period of the tityra is probably no less than this.

CARE OF THE NESTLINGS

Since my sojourn on Barro Colorado Island came to an end before the eggs hatched in the decaying trunk standing in the water, I have never seen unfeathered nestlings of the tityra. Possibly they are quite naked and devoid of natal down, like those of the Slate-bellied Becard. Both parents join in feeding them; and since the male brings food to the nest even before they hatch, it is probable that he does not delay long in attending to their wants. Their mother alone broods them. If their father arrives with food while she is in the nest, he does not, like so many male birds, give it to his mate to be passed by her to the little ones beneath her, but alights on a near-by perch and continues patiently holding it, until at her own good time she departs and leaves the nestlings free to receive the morsel he has brought. I have seen him wait for a quarter of an hour, from time to time going to the doorway to look into the nest, or voicing a slight grunt to preclaim his presence, until at last his brooding mate flew away and he could deliver his offering to the little ones. At one nest the male tityra somehow lost all of his tail, but despite this handicap continued faithfully to bring food to the nestlings.

The food of the nestlings consists largely of insects of various kinds, caterpillars and spiders. Once I saw a male tityra bring a small lizard to the nest. The tityras do not often forage in the clearings where they nest, but among the tree-tops in the neighboring forest, where it is seldom possible to watch them as they hunt. When they arrive at the nest, the food, carried in the bill, has been well mashed and is difficult of recognition. The frequently green color and massive bodies of the insects brought for older nestlings suggest that they were captured among the foliage rather than in the air. My observations on the care of the nestlings have been oft-repeated at a number

of nests rather than long-continued, and I have always found the male doing his full share of the work. At one nest in southern Costa Rica I watched for three hours, during which the male brought food nine times, the female ten. This lofty hole contained at least two nestlings that no longer required brooding during the day, but their exact age was unknown. Both parents attend to the sanitation of the nest.

I have, at several nests, attempted to learn the approximate age at which the young depart, not by direct inspection of the contents, but by watching from the ground to determine the length of the period during which the parents take food into the cavity. At a nest in southern Costa Rica, the tityras began to feed nestlings on April 20, 1936. It was May 10 before I glimpsed a nestling's head in the high doorway. Now the parents merely clung in front of the entrance to pass in food to their offspring, which evidently climbed up the inner wall of the old woodpecker hole to receive it. Three days later, the nest was empty, and there was a large gap in the side wall, apparently made by some predatory animal. I thought that the young tityras were old enough to have made their escape if threatened, and looked for them in the neighborhood, but in vain. The parents were present, and seemed to enjoy more leisure than they should if they had fledglings to feed; so I fear that the young met a premature and unhappy end. They had remained in the nest at least 21 days. From another nest, the young made a successful exit 19 days after I first saw the parents take food into the hole, but apparently the nestlings were then already several days old. The nestling period of the Costa Rican Tityra is at least three weeks, and probably several days longer. The nestling period of Fraser's Tityra, a bird of the same size and very similar habits, is at least 25 days.

Upon leaving the nest, the fledgling tityras are led into the neighboring forest, where it is almost impossible to keep track of them. Their plumage is brownish, closely resembling that of the adult female. Two young birds reared in a hundred-foot-high hole in a forest clearing sometimes followed their parents back into the clearing as these made ready for a second brood in the same hole. Eighteen days after quitting the nest, when their mother had begun to incubate again, these young tityras would sometimes accompany their father into the clearing; but usually when he came to escort his mate back to the nest, they remained behind. After a few more days, they were no longer seen in the neighborhood. They appeared to remain dependent upon their parents, at least in part, for about three weeks after flying from the nest, or until about six weeks of age.

While attending nestlings, both male and female occasionally bring pieces of leaf to the nest. At one nest, I saw both parents do this repeatedly. Sometimes the birds drop these bits of leaf while resting near the nest, sometimes while clinging in front of the doorway, when the fragments flutter down in a manner that leaves no doubt as to their identity. Again, the leaves may be taken inside, and not improbably placed in the expectant mouth of a nestling! The tityras appear to bring this material from old habit or pure absent-mindedness; it evidently plays no rôle in their domestic economy at this stage of the nesting. The female tityra whose three-week-old nestlings seemed just to have been lost, as already related, was seen to gather a billful of dead leaves in the top of a neighboring tree, then let them fall to earth. Thus tityras at all stages of the nesting may, at times, perform acts which seem more properly to belong to an earlier or a later stage, such as bringing food before the eggs hatch (by the male, at least), bringing nest material while incubating or even while feeding nestlings. They are birds of wavering determination, finding it difficult to make up their minds as to what they will do next, often changing their decisions, and not infrequently absent-mindedly doing things that bear no relation to the matter in hand.

THE SECOND BROOD

In Costa Rica, the tityras frequently, if not regularly, attempt a second brood when they have been successful in bringing out their first at an early date. A female whose nestlings had departed on or shortly before April 29, 1936, was seen to enter and rest in the doorway of the nest-hole on May 9, while still feeding two full-grown young birds. On May 11, she went into the hole in the evening to pass the night. By May 17, she was certainly incubating again in the nest where her first brood had been reared, leaving her mate to attend the young birds, which seemed to be becoming rapidly self-supporting. By June 5, both parents were feeding the nestlings of the second brood, the older offspring having meanwhile gone their own way. By June 25 the nest was empty; and although the fledglings were not seen, the aggressive behavior of the usually so mild parents suggested that their little ones were hiding near by.

In late May of the following year, I found two pairs building nests, most probably for second broods. Soon after arriving at Vara Blanca, I found a pair of tityras feeding nestlings at an altitude of 5,300 feet, as late as July 16, 1937. In late May and June, 1939, two pairs of tityras engaged in a long-continued dispute for the possession of a nest-site, most probably for a second brood.

In 1943, I again found very definite evidence of a second brood. The nestlings of the first brood had departed from the old woodpecker hole on or about May 21. By June 26, their mother appeared to be incubating again in the same hole. On the evening of July 11, this bird behaved most queerly. As the day waned, she stood in her high doorway, looking out, then flew forth, only to turn in mid-air after she had gone only a few inches, and return to the doorway. She repeated this several times, then flew out and away in the fading light. Possibly my presence below the nest disturbed her, but it had not done so on past evenings. After that, the nest was abandoned. This observation suggested the desertion of well-incubated eggs through the waning of the reproductive urge late in the season. But the incompleteness of the evidence renders it inconclusive. Possibly the nest had been robbed during the day; possibly the eggs were infertile. The position of the lofty hole discouraged the investigation of this point.

TERRITORIAL RELATIONS

The Costa Rican Tityra is most decidedly a 'territorial' bird. Indeed, it is one of the relatively few tropical birds, especially among those of the tree-tops, which I have seen engage in disputes over territorial jurisdiction, although these have never assumed the violent form so often described for northern birds. A clearing at the edge of the forest, several acres in area, may contain a number of fire-killed trees, each of which has one or more holes that would be suitable nest-sites for the tityras; yet I have never known more than a single pair to breed in such a clearing. The only tityras' nests that I have seen at all close together were those in the three palm trees already mentioned. Unfortunately, I failed to measure and record the distance that separated these trees, but all stood not far apart in the same small pasture. Each palm seemed to offer sites for many nests, but the birds' intolerance of close neighbors of their own kind prevented their becoming tityra apartment-houses. Possibly the fact that the wide-spreading fronds of the palms to a certain extent screened the tityras from each other made it possible for these three pairs to nest here closer together than one would find them in the usual dead and naked trunks, where they are visible from afar.

I have numerous observations bearing upon the defense of territory by tityras, only a few of which can be given here. On March 27, 1936, while I watched a nest of the Golden-naped Woodpeckers situated in a clearing at the edge of the forest, a pair of tityras flew out from among the trees. The male tityra alighted on top of the wood-

peckers' tall trunk, while his mate went to examine the hole in which these birds had, until recently, slept. She also investigated lower portions of the decorticated trunk, clinging to its smooth surface. Presently she went back into the forest, soon to reappear with a fragment of dead leaf, which she took toward the woodpecker hole. At this point another pair of tityras, which had, a short while before, begun to nest in the tall, dead trunk in the center of the clearing, discovered the trespassers, flew at them, and drove them unresistingly away. The trunk where the established pair of tityras nested was about a hundred yards distant from that which the new arrivals examined.

Two days later, this or another pair of tityras visited a more distant dead tree where another pair of Golden-naped Woodpeckers had their nest. The female tityra tried to force herself into a hole half-way up the trunk that was far too small to admit her. Once she looked into the woodpeckers' nest, but finding one of them incubating within, left it at once. The male tityra was chiefly an interested onlooker, but both he and his mate went to look into some small excavations made by the woodpeckers, too shallow to serve for nesting. The pair returned several times to repeat their investigation of this trunk; and the female, ever hopeful, each time tried to squeeze herself into the narrow holes.

The following year there was again a single pair of tityras nesting in the clearing, now in the hole which the first pair of Golden-naped Woodpeckers had made the preceding year. On February 27, when this pair of tityras were on the point of beginning to fill up the bottom of the hole they had already chosen, their long and tranquil occupancy of the clearing was threatened by a sudden invasion. During the last hour of the day, four others of their kind flew out of the neighboring forest, and there was much excitement all around. All six rested not far apart among the boughs of the same small tree, called in their thick, grunty voices, and twitched, fanwise, their short, black-and-white tails. Presently one would dart at another, which would quickly change his position to avoid a collision; and this might cause a general shifting about of the whole group. Then one would start to fly across the clearing, and some or all of the others would follow closely. They might all settle together in another tree in the clearing or about its edges, or else fly out of sight over the neighboring forest. But soon they would return, and grunt and dart at each other, and fly about together just as before. They continued to fly over the clearing until the daylight began to wane, then vanished into the forest.

Early next morning, the flock of tityras returned to the clearing and behaved as on the preceding afternoon. Later in the morning there were seven individuals in the group, which was now made up of five miles and two females, including the resident pair. The stranger males were evidently trying to win the resident female from her mate, each for himself. The proceedings would have been more interesting to watch had I been able to distinguish the accepted male from his rivals. The birds were long in coming to the point; all seemed to lack resolution; and the discussions promised to be long drawn out. The tityras are mild-tempered birds and do not like to make violent scenes.

By the morning of March 1, the invading army of tityras had dwindled away, and only two males followed the female as she flew across the clearing. Next morning, I again saw two males flying after her as she winged over the clearing; but later she returned with a single one. I would have given much to know with certainty whether he was the same that had been with her from the first, and had successfully routed the whole crew of upstart pretenders to his mate's affections. His familiarity with the clearing and its potential nest-holes seemed to indicate that he was indeed the old-established master thereof. After tranquility had been restored to the clearing, the female tityra gathered a billful of dead leaves from a neighboring tree-top, and, after some delay, took them into the woodpecker hole—the first material that she actually carried inside in my presence (see p. 349).

From time to time, during the next two months, strange tityras wandered into this clearing; but I saw no other attempt to disrupt the domestic harmony of the mated pair until April 20, when they were feeding nestlings. On this date, as the female tityra returned to the nest with food in her bill, she was followed by two intruding males, which came to rest in the top of a neighboring tree. Paying little heed to them, after a short delay she flew into the hole to deliver the food. Then one of the intruders flew to the top of the trunk that contained the nest, where he clung for a few moments. Soon he flew back and perched a foot away from the other; both called and flirted their tails. When the father of the family soon after returned and saw these trespassers, he darted at them twice, and they tamely withdrew into the forest. The head of the family did not even deem it necessary to empty his bill before beginning to negotiate with the strangers, and as soon as they were out of sight, he went to the nest to deliver what he had brought for his nestlings.

It seems that it is the custom for unattached male tityras to go a-wooing by twos or in small flocks. On page 332 we have given another example of this.

Close beside a little-used roadway in the Valley of El General stood a tall dead tree, barkless but with numerous branches, that in May and June, 1939, claimed my attention by virtue of the many birds that found shelter in it. The gaunt arboreal skeleton rose above a low, densely entangled thicket; but two hundred yards away began the forest, and the tree was not too far distant to attract some of the forest birds. Here a pair of Golden-naped Woodpeckers reared their family of three; a pair of Thin-billed Wood-hewers (*Lepidocolaptes souleyetii compressus*) fed their nestlings in a natural cavity eighty feet above the ground; two Frantzius's Araçaris (*Pteroglossus frantzii*) slept in an old hole made by one of the larger woodpeckers. In addition to these occupied cavities—all of which were deserted by early June—the tree contained several other holes carved out by the big Pileated Woodpecker (*Ceophloeus lineatus*), or possibly by the Guatemalan Ivory-bill (*Phloeoceastes guatemalensis*). From May 24 to June 17, if not for a longer period, one of these empty holes was the cause of an interminable dispute between two pairs of tityras, both of which wanted it for a nest-site, probably for a second brood. The tree contained enough unoccupied cavities to accommodate both pairs; but each pair insisted upon having the whole tree and the surrounding territory for themselves alone.

On June 8, when these lengthy discussions between the two pairs were at their height, I wrote in my journal: "With characteristic mildness of temper, patience and persistence, the two pairs have now protracted their dispute for over a fortnight. All four birds will rest among the dead branches, quite close together at times, apparently in perfect amity. Of a sudden, one will dart at a member of the other pair, causing it hastily to shift to another perch. Then they will flit about confusedly for a few moments, apparently greatly excited, voicing their grunty notes and twitching their tails as they rest between movements, but rarely if ever striking each other; for the individual who sees itself the object of another's attack invariably retreats. The flare-up over without any bird having suffered the slightest injury, all rest from their nervous exertions quietly side by side as before. Soon becoming hungry, all four wing away in company to the forest, where doubtless they forage in unruffled fellowship. After a brief absence, all four return together to the dead tree, to resume the interrupted argument in the same intermittent fashion as before.

"I noticed a few days ago that one of the female tityras had lost most of her tail feathers, but whether by the agency of her rival or otherwise, I have no means of knowing. If one tityra succeeded in depriving another of a portion of her tail, it must have been a great surprise to both the parties concerned. Yesterday evening and this morning the mate of the whole-tailed female failed to appear. I do not know what can have befallen him; possibly he fell victim to the White-throated Falcon (*Falco albigularis*) or some other bird of prey; but I feel sure that his mild adversaries of his own kind are not the cause of his absence, whether it be temporary or for all time. The three survivors carried on the dispute this morning in just the same fashion as the four formerly did, going off to forage together between sessions in the big dead tree. The argument seems to have become a habit with them, and they would feel lost if they were to discontinue it. It is the female with the undamaged tail who most frequently enters the coveted cavity, but she never stays long within. Sometimes the other pair dart at her as she goes into it."

But by June 15, the other pair of tityras appeared to be in the ascendancy. The whole-tailed female had found her old mate, or a new one, as the record made on this date shows: "This morning a single pair of tityras, that of which the female lost most of her tail, had undisputed possession, so far as their own kind was concerned, of the big dead tree. They loitered much among its upper branches, sometimes went to peer into its cavities, and once the female entered the hole which was in dispute between the two pairs. Yet they did not appear to be preparing to breed. Late in the afternoon, while I watched the Golden-naped Woodpeckers retire, the second pair of tityras arrived in the tree, and the dispute between the two pairs was resumed in the fashion I have already described. Several times both pairs flew off together to the forest, then returned in company to the dead tree. Finally, as night approached, all four tityras winged away to the forest together, probably to roost in the same place."

On the morning of June 17, five tityras, three males and two females, flew into the dead trees together, and engaged in the same sort of harmless altercation as on so many past mornings. After a while, all five flew away together; and I have no further record of tityras at this tree. On my last visit to it, on June 25, neither pair had begun to nest there; and in view of the lateness of the season, it is highly improbable that they did so that year.

Thus the net result of this long-drawn-out dispute was that neither of the two pairs reared a brood—at least, not a second brood. But

when we consider the many evils attendant upon over-population, was not this a most happy result? If the tityras were already so numerous in this region that all could not find isolated nest-trees—and they were indeed very abundant locally, so that every suitable dead tree seemed to shelter a nesting pair—they would only have created a more difficult situation for themselves in the following year, if they further increased their population. Had they been more fierce or more determined birds, one pair might have killed or disabled the other, and so quickly have reached a decision; but then the two offspring they might have reared—if their enemies of many kinds had not broken up the nest—would merely have sufficed to refill the gaps they themselves had caused in the population. This is the way that fiercer creatures would have settled the difficulty; but the tityras' way seems better: they preserved the breeding population intact for the exigencies of future years; and they appeared to enjoy their earnest if inconclusive conversations. We marvel at the manner in which birds, particularly in the Tropics, preserve their numbers at a fairly constant level from year to year, never seeming to undergo such extreme fluctuations in population as have been observed among many mammals and birds of the far North. This episode of the tityras shows us one of the ways in which the regulation of numbers may be accomplished.

While the Costa Rican Tityras argued over the nest-hole, a pair of Fraser's Tityras built their nest in another hole in the same tree, undisturbed by them. Although so similar in coloration, the Fraser's Tityras do not arouse the territorial jealousy of the Costa Rican Tityras, as others of their own species do. The former may perch undisturbed close by a nest of the latter, and both may breed in the same clearing. I have, however, seen a male Fraser's Tityra drive Costa Rican Tityras from the trunk that sheltered his nestlings; but this was probably a manifestation of parental zeal rather than of territorial jealousy.

Relations With Other Species

As with so many other hole-nesting birds unable to carve out cavities for themselves, the tityras' manner of nesting brings them into competition not only with wood-carving species, but with other hole-users in the same plight as themselves. In the first category are the woodpeckers whose holes they covet, often before the makers have finished with them; in the second class are araçari toucans which nest and sleep in holes made by the bigger woodpeckers, swallows, House Wrens, Fraser's Tityras, and numerous other birds.

WITH THE GOLDEN-NAPED WOODPECKER (*Tripsurus chrysauchen*).—This small woodpecker is numerous among the forests at lower elevations on the Pacific side of southern Costa Rica, where tityras are abundant. Its holes are a favored nest-site of the tityras. They are deep and spacious, usually placed high, and carved into fairly sound wood; their narrow doorway keeps out the Frantzius's Araçaris (*Pteroglossus frantzii*), which easily enter the holes of the bigger Pileated Woodpecker and the Guatemalan Ivory-bill. The clearing where for two years I watched the activities of a pair of tityras was also the home of a pair of Golden-naped Woodpeckers and a pair of Wagler's Woodpeckers (*Centurus rubricapillus wagleri*). The hole of the latter also has a narrow doorway; and the male Wagler's Woodpecker carved far more holes during the course of the year than did the pair of Golden-napes; but they were always in such soft wood that by the time he and his mate had abandoned them as dormitories, they were in a more or less ruinous condition. The tityras took little interest in the holes of the Wagler's Woodpeckers, but in both years nested in cavities formerly occupied by Golden-napes.

Family bonds are strong among Golden-naped Woodpeckers (*see* Skutch, 1943). After the young birds begin to fly about, they return at nightfall to sleep with their parents in the hole where they were hatched and reared. This chamber may continue to serve as their family bedroom until the young birds disperse as the subsequent breeding season draws nigh, in March of the year after they hatched. At this time, the parents begin actively to enlarge a new hole for the reception of their eggs, often in the same trunk where they nested the preceding year.

In February, 1937, a pair of tityras began to take an interest in the lofty chamber where the pair of Golden-naped Woodpeckers had nested in 1936, and where they still slept with one full-grown son. On March 2, I for the first time saw the female tityra take material into this cavity; but it is not impossible that she carried in a few pieces in a desultory manner at an earlier date. About this time, the Golden-napes temporarily abandoned this hole for others near by, apparently because of molestation by the tityras. But they did not find their new quarters satisfactory, and by March 6 the three were again sleeping in their former dormitory. On the evening of March 11, I saw one of the male woodpeckers throw out a rather long stick and many pieces of dead leaf which the tityra had taken into his bedroom, thereby undoing most or all of her day's work. Father and son slept in this hole, while the mother retired that night to

rest alone in the new hole which the pair were now rapidly enlarging lower in the trunk, but which was still too small to accommodate all three of the Golden-napes.

Next day the female tityra resumed the work of filling up the woodpecker's dormitory. That night all three woodpeckers slept in it, without throwing out more litter as they retired. This was the last time the entire woodpecker family slept in the hole that had sheltered them for nearly a year. On the evening of March 14, a male—probably the father—slept alone in it. About this time the young male vanished, doubtless having gone off to set up housekeeping for himself. A few days later, the parent woodpeckers established themselves in a new hole they had very rapidly carved far down in the trunk, and here the female soon afterward laid her eggs. They had deserted their nearly completed new hole close below that claimed by the tityras, and another newly begun somewhat lower still; but whether because of the tityras' presence or from some other cause, I do not know. It was March 29 before I found the female tityra sleeping in the Golden-napes' former dormitory, where apparently she now had eggs.

The change in ownership of this hole was effected, so far as I saw, without any actual fighting between the tityras and the woodpeckers. If the woodpeckers happened to be working at their new hole lower in the trunk when the tityras arrived, they appeared uneasy and sometimes flew away. Rarely a tityra would actually fly toward a woodpecker as it carved at the tree-trunk, causing its prompt retreat. But the tityras also appeared to be slightly afraid of the woodpeckers, and accordingly encounters were studiously avoided by both parties. I have seen Golden-naped Woodpeckers relinquish their dormitory to Fraser's Tityra in an equally pacific fashion, and at a season when they would not, as the pair we first considered, have moved into a new hole anyway in the usual course of events. There was never any use of force between the two kinds of birds; but the woodpeckers seemed to grow tired of throwing out the trash that the cotinga so persistently carried into their bedroom, and at length concluded that it would be easier to carve a new chamber in a neighboring part of the same dead tree.

Although tityras are usually even-tempered, peace-loving birds, now and then one finds an individual with a fiery disposition. In late June, 1943, a female was preparing to rear a second brood in a dead tree standing in a pasture. In another hole in the same trunk slept a family of Golden-naped Woodpeckers, parents with two sons a few

months old. In May, the tityras had reared their first brood at the same time that the woodpeckers reared their only brood; and during this period I saw no indications of enmity between them. But now, on the evening of June 24, the female tityra suddenly developed an antipathy to her neighbors. She stood atop the highest fork of the old trunk, and as the woodpeckers approached their bedroom door below her, darted angrily down at them, coming very close, making an audible *snap* with her bill when nearest them, throwing them into great excitement, and causing them to retreat to a neighboring dead tree. One finally fled to a grove a hundred yards away. From her lofty lookout at the top, the tityra swooped angrily down at the woodpeckers whenever they returned to the trunk, and so kept these early roosters in the open until past their usual hour of going to rest. Then three Frantzius's Araçaris arrived to enter their dormitory lower in the same trunk, and hold both tityra and woodpeckers at a distance until they had entered their roomy chamber, the work of one of the larger woodpeckers. When they had settled down for the night, the tityra resumed her perch at the very top of the trunk, and now quietly watched the Golden-napes as they cautiously slipped through their bedroom door. Finally, in the fast-failing light, she winged away toward the river.

Next morning, I twice saw this tityra dart toward one of the Golden-napes as it rested innocently in a tree-top at the edge of the forest, fifty yards from her nest, putting it to flight. But the following evening she remained quietly in her nest-hole while the woodpeckers retired, and did not molest them.

WITH PUCHERAN'S WOODPECKER (*Centurus pucherani*).—With this wide-ranging woodpecker, the tityra comes into contact over a far greater area than with the Golden-naped Woodpecker. So far as I have seen, the habits of Pucheran's Woodpecker are quite similar to those of its congener; and the holes carved by both are equally desirable shelters for the tityra's nest. In April, 1941, I found a pair of these woodpeckers sleeping in a hole that appeared to have been freshly carved, forty feet up in a barkless trunk standing in a maize field in the Pejivalle Valley, in eastern Costa Rica. They also spent considerable time in this cavity by day, and seemed to be preparing to incubate there, but since they still removed loose chips from the bottom, the female woodpecker had probably not yet begun to lay. On April 27, a female tityra was carrying dead leaves into this hole. The woodpeckers promptly began to work at a new hole lower in the same trunk, where, as soon as it was big enough, they slept, and

later nested. Here, as with the Golden-naped Woodpeckers, the tityra acquired possession of the coveted hole without my having witnessed any fighting between the two kinds of birds, although I spent a good deal of time in view of the trunk. For some reason or other, she did not rear a family in this hole.

WITH THE COSTA RICAN WOODPECKER (*Piculus rubiginosus uropygialis*).—In the Costa Rican highlands, a pair of tityras claimed an old woodpecker's hole in the dead top of a living tree standing in a pasture, and began to fill it with the usual dry leaves and trash. During their absence, a male Costa Rican Woodpecker arrived and began to throw the material out of the doorway. For at least two days he continued to clean out the hole, at times becoming quite excited and repeating over and over his loud, rolled call. But no fighting was witnessed between the woodpecker and the tityras; and when the former looked through the doorway and found the female tityra within, he promptly flew away as though in alarm. The woodpecker was not nesting in this hole, nor did he use it as a dormitory. Possibly this was his nest-chamber of the preceding year, and he still retained a proprietary interest in it. The tityra apparently never laid in this cavity.

Sutton and Pettingill (1942) writing of tityras of the Mexican race (*T. s. personata*) state: "April 4 to 8, a pair at the Rancho sparred fiercely with a pair of Golden-fronted Woodpeckers [*Centurus aurifrons*], who were doing their best to finish a nest for their own use." This observation shows a very different temper, not only of the tityras but also of the woodpecker, from that which I have found usual of the Costa Rican Tityra and the woodpeckers with which it comes in contact.

WITH FRANTZIUS'S ARAÇARI (*Pteroglossus frantzii*).—With these brilliant, red-billed toucans, the tityras' relations are somewhat more complex than with the woodpeckers; for not only do the two species at times compete for the possession of one of the big holes abandoned by the early-nesting *Scapaneus* or *Ceophloeus*, but the tityras fear these great-billed, nest-robbing birds for the injury they may inflict upon themselves or their offspring.

On April 19, 1939, I found a pair of tityras carrying material into an old hole of one of the bigger woodpeckers, in the top of a tall dead tree standing in a narrow, bush-choked clearing between two strips of forest. This cavity was the dormitory of three araçaris. Probably, when they began to prepare a nest in the hole, the tityras were unaware of the other birds' prior claim, for the araçaris were

absent all day; but they soon discovered that they would not remain in undisputed possession. In the evening, before the araçaris flew out of the forest to go to rest, the tityras would arrive and perch in commanding positions near their chosen hole. Then when their great-billed antagonists winged toward the doorway of the dormitory, they would give chase, and dart close by them as they clung before the entrance looking in, as they did every evening before slipping inside, to make sure that no creature that could harm them had hidden away in the cavity during the day. The zeal which the tityras displayed in worrying the araçaris varied from evening to evening. Sometimes they would dart back and forth above their heads while they perched, and pursue them hotly as they flew. Again, their demonstrations were far milder. Often they expended all their store of anger on the first araçari that approached, and allowed the others to go to roost in comparative peace. But if they ever actually touched the araçaris, it was a very slight, ineffectual contact; their display was almost wholly bluff; and the araçaris paid scarcely any attention to it.

But if the tityras' threats made little impression upon the araçaris, and quite failed to keep them out of their customary bedroom, they knew another and more effective way of evicting the bigger birds. By day the tityras, chiefly the female, labored to fill up the cavity with dry leaves and inflorescence stalks that they plucked from neighboring trees. Soon the araçaris found their quarters becoming cramped. On the evening of April 24, the tityras did not come to defend their nest in their usual fashion; but what they had accomplished during the day disturbed the great-billed birds far more than their own presence might have done. The three araçaris arrived at their customary late hour, and one entered the hole. A second tried to follow, but seemed to experience unwonted difficulty in passing through the doorway, for several times it stuck in its head only to draw it out again. At last it gave up the attempt to enter and flew back to the edge of the forest, followed by the third araçari, which had been watching from the top of the lofty stub. Then the one that had gone in emerged and also flew back to the forest. Next, the araçari which had found it so difficult to enter came again to the doorway, stuck in its head, pulled out a bunch of material in the end of its long, red bill, and flew off to a neighboring tree, where it dropped the load. Finally two of the araçaris returned and managed to enter together, the third going elsewhere to sleep. Araçaris usually have a number of lodges available for just such emergencies.

The next evening the tityras were again on hand to receive the

araçaris. When two of the toucans arrived to enter their dormitory, the tityras pursued them with far less spirit than on past evenings. This time the second araçari went in without much difficulty. Then the tityras perched side by side on the truncated end of the branch that contained the hole, often leaning over the edge to peer down, as though they tried to see what their enemies were doing there. Finally, as it was fast growing dark, the male tityra flew off to the east, leaving his mate alone on the end of the stub. While she stood there in the dusk, a third araçari arrived very late, and tried to join the other two in the hole. Finding it difficult to squeeze head-first into the scant remaining space, it turned about and inserted itself forcibly rump-first, with its tail doubled forward over its back. This was the first time that I ever saw a toucan enter a cavity in this retrograde manner. As it slowly pushed itself in, the female tityra fluttered toward it in a faint-hearted manner. Then, after delaying longer on the end of the stub, she dropped down and hovered a moment before the doorway of the nest-cavity, as though she desired to enter, but feared to have the araçaris as bedfellows. After another rest atop the stub in the gathering dusk, she winged away to the forest.

I believe that the female tityra had reached that stage in her preparations for rearing a family where she would have slept in the hole had it not been for the araçaris. Next morning, at seven o'clock, she arrived with a billful of dead leaves, and four or five times flew up in front of the doorway as though to go in but, without actually touching it, dropped down to cling to a lower portion of the tree. Apparently she was not sure that all the araçaris had departed. Finally, after ten minutes of this vacillating behavior, she screwed up her courage to the sticking point, clung to the doorway, peered cautiously in, then entered with her pieces of leaf. She lingered within for about twenty minutes, and I suspect that she laid an egg.

That evening four araçaris arrived at the dead tree, and were pursued by the tityras in their usual fashion. The big birds were rather unsettled; for after two had entered the hole one on the outside called sharply, bringing them out again; and all flew back into the forest. Two and then a third returned; and although the second experienced considerable trouble in pushing itself inside, the third, folding its long tail forward and turning about, managed to struggle backward into the top of the chamber. If the tityra had indeed laid an egg in the morning, I fear that it was smashed by the three toucans sleeping above it.

Next evening, April 27, the araçaris again entered the hole despite

the half-hearted demonstrations of the tityras. These lingered atop the stub in the failing light, occasionally peering down over the edge. As it grew darker, the male flew off, leaving his mate alone on the stub. She fluttered many times before the doorway of the cavity, and once almost touched it; but in the end her fear of the araçaris—or her common sense—prevailed, and she flew off through the dusk in the direction her mate had taken.

On the evening of April 28, the tityras were not present. Two araçaris arrived, examined the cavity from the outside, then flew off. I thought that perhaps the female tityra had stolen a march upon them and entered before they or I arrived, but the vigil which I began at dawn of the following day proved conclusively that neither tityra nor araçaris had slept in the hole. The tityras arrived from the forest at daybreak and rested a while on the end of the stub; but soon the male flew off, and after a brief delay the female followed.

During the next few nights, either one or two araçaris slept in the hole, sometimes pushing in backward. But after May 2, they no longer used this cavity for roosting. If the tityras were at all responsible for their change of residence, they had achieved this result, as appeared likely, by filling up the cavity and making it uncomfortable for the toucans, rather than by their harmless threats of attack as the original tenants retired in the evening. But after the tityras gained possession of the coveted hole, they were slow in making use of it. This was probably because the egg or eggs which the female had apparently laid there about April 27 had been broken by the araçaris; her strong desire to enter the hole at nightfall at this period was almost certain proof that she had laid. The tityras now usually spent the last half-hour of the day resting in or near the dead tree that contained the cavity, but as the light grew dim both flew off to the forest. By May 16, nearly a month after I found her building a nest here, the female had at last begun to incubate in this hole. Mild-mannered though they be, the tityras often come off victorious, even in conflicts with far bigger and more powerful birds, by virtue of their great persistence. Perhaps the tityras' need to adopt a Fabian policy, in disputes with more powerful rivals, accounts for the dilatory, indecisive character that is so evident to anyone who watches them closely.

I regret that I can not record a happy ending for this nesting; but before the young were fledged the hole was abandoned by the tityras. On an evening in early June, five araçaris arrived at the dead tree. One went to look into the hole where the tityras had attempted to

rear a brood, but did not enter. Then all flew back into the forest. The high chamber was abandoned by both of the parties that had so long contended for its possession.

In an earlier year, a pair of tityras nested in the same tall dead tree where from two to five araçaris often lodged for the night, and were often made uneasy by their huge-billed, piratical neighbors. The tityras occupied a hole a hundred feet above the ground, where earlier a Golden-naped Woodpecker had slept; while the araçaris used a slightly lower and much more capacious cavity, from which a brood of Pileated Woodpeckers had recently departed. At the beginning of March, 1936, when the tityras were ready to occupy their nest, one or both members of the pair would come each evening to rest upon high, exposed perches near by and await the arrival of the araçaris. They would closely pursue the bigger birds as they flew up to the dormitory, and dart above their heads as they clung before the doorway before crawling through. Yet I never saw them actually strike the araçaris; and the big-billed birds seemed to take slight notice of these menaces. Sometimes, as they flew at their enemies, the tityras, especially the male, uttered a queer little grunt.

During the day, the female tityra had been spending considerable time in her nest, where at intervals her mate came to look in through the doorway, but by March 9 she had apparently not yet begun to incubate. That evening, after her ineffectual feints against the araçaris, she alighted upon the topmost point of a very tall and slender, naked trunk standing close beside the one in which the toucans slept and she had her nest. Here she rested motionless, a very lonely little figure silhouetted darkly against the fading sky above the western ridge, while all the bird world sank into drowsy silence. What a struggle must have been taking place in her small breast as she stood, outwardly so reposeful, against the great, darkening, cloud-veiled sky! The hole in which she had built her nest and possibly also laid an egg or two, in which she sat every morning to prove her possession, was unattended; and the hour had come when growing parental impulses prompted her to sleep in it. But just below were two larger, more powerful birds which she feared; and she hardly dared to pass the night so close to them, although several feet of solid wood separated their chamber from her own.

Finally, when even the late-retiring motmots and woodhewers had settled down for the night, and the bats had begun to flit through the dusk, the lonesome little bird made a move toward the round entrance of the hole, now scarcely visible in the darkening trunk.

But in front of it she lost courage, fluttered on beating wings, and rose to rest upon the top of the trunk. After a brief interval of outward immobility, she dropped down again to the hole. Again she lost courage at the critical moment, fluttered, and this time flew to a more distant tree to rest and gather courage for another attempt. Five or six times in all she started to enter the hole, and as many times she veered aside without actually touching the doorway. After her final attempt, instead of going again to some near-by perch, she turned her course toward the woods to the south, whither she and her mate had gone on former evenings, and vanished amid the dark woodland leafage. It was by this time so dark that I felt sure that she would not return that night. She had not been quite brave enough, and sought the company of her mate instead of occupying the dark cavity in the tree alone.

The next evening, the male tityra lingered with his mate after the two had pursued and threatened the two araçaris that retired into the Pileated Woodpecker's hole. In his presence she found greater courage, and after a little hesitation entered the hole so near that in which the dreaded toucans had stowed themselves away. But she was not entirely confident, for she leaned far out of the entrance, and once flew or fell out, only to turn about before she had gone many inches and return to the interior. In a very short time she flew out and away to join her white mate, which watched from a neighboring perch. But his roosting-time had come, and now he flew off to the forest on the south, leaving her once more to face her inner conflict alone. After some delay, the female tityra returned to her nest for the second time that evening. But she was too ill at ease there, and in a few minutes abandoned it again to perch on a high stub of the next dead tree. As she stood there motionless in the failing light, a third araçari joined the other two in the Pileated Woodpecker's hole, and she darted past it as it went in. As on the preceding evening, she started several times toward her hole, only to flutter before it and return to a lofty perch. In the end her courage again failed, and she winged off through the dusk to seek her mate.

The following day I set forth on a long journey and was absent until March 22. Upon my return, I found that the female tityra had conquered her fears and now slept in the nest with her eggs. Her mate would linger in the clearing as the day waned, but flew off into the forest before the arrival of the single araçari which now remained in sole possession of the Pileated Woodpecker's hole. The big bird now retired late, and his impact against the trunk would

bring the female tityra out of her nest in time to dart at him, uttering a little scolding grunt, as he slipped inside. Soon she resolutely returned to her nest, making no false starts, to sleep within a few feet of the monster she dreaded. During the next two weeks, this sally from her nest, to dart at the araçari as it entered its dormitory, was the evening ritual of the female tityra.

The araçaris were now also nesting the same clearing, in a neighboring trunk. The member of the pair which did not incubate by night lodged alone in the trunk where the tityras had their nest; the two or three other araçaris that had taken shelter their earlier in the season had somehow been induced to leave the breeding pair alone in the clearing. Although the araçaris are undeniably fond of a meal of eggs or nestlings, for some reason they spared those of their neighbors, the tityras. Perhaps the narrowness of the doorway protected them; but I once saw an araçari remove an egg from another hole built by the same kind of woodpecker, and therefore, presumably, with a doorway of the same diameter. By the second week of April, the nestling tityras were reaching the age when they no longer required much brooding. Now their mother remained out later in the evening, and instead of being found in her nest when the araçari arrived, was waiting high up in some neighboring dead tree to give it chase. After the great-billed bird had gone into its bedroom, she wavered in her determination to enter the nest, just as she had done when beginning in incubate. She went to the doorway, clung hesitantly there, then flew up to the top of the trunk, where she lingered until the light had grown dim. I could hardly distinguish her when, after a long delay at the doorway, she entered for the night.

Ten days later, when the nestlings were evidently becoming well feathered, the female tityra still exhibited this vacillating behavior at nightfall; but now the balance of forces had tilted to the opposite side. All through the day, both parent tityras never lost an opportunity to chase their red-billed neighbors as they flew about the clearing performing the duties of their own nest; but the bigger birds suffered slight inconvenience from this unremitting though mild persecution. In the evening, after the young tityras' hunger had been satisfied, their parents would rest upon some neighboring perch to await the arrival of the araçaris. The male would nearly always grow impatient, or drowsy, before the araçari arrived in the gathering dusk to enter its dormitory. Sometimes he would make a start toward the forest, only to circle around and return to his mate when he saw that she did not follow, repeating this several times

before he actually flew into the woodland, leaving his mate to guard the nest alone in the twilight. After she had seen the araçari safely into its dormitory, she would alight on top of the high trunk and bend over the edge, peering down toward her nest. Then, after a further delay, she started off toward the forest, but described a long loop in the air which took her back to the top of the trunk where her nest was. She made a move to enter, but in the end took flight once more, in a long, wavering course which ended in the crown of a mighty tree growing in the forest to the south, possibly the same in which her mate had already gone to roost. Was her vacillating conduct caused by anxiety for her nestlings, her fear to leave them sleeping alone so near the dreaded araçari, even when they no longer required her warmth by night; or was it merely that she wavered between an old habit and a new one in process of formation?

Although she now no longer covered the nestlings during the night, when there was little to be feared from the sleeping araçaris, she and her mate would resume guard over the nest in the dim light of early dawn. The araçari would look out of its dormitory once or several times before it flew north; and at each appearance of the great red bill in the doorway, the tityras would start in its direction. When at length the araçari issued forth, both pursued it closely as far as the edge of the forest. And each evening the mother tityra would guard the nest until it was nearly dark.

Despite their fears of the araçaris—or was it because of the precautions these fears led them to take?—the tityras successfully reared their two nestlings, which made their debut into the world about April 21. The araçaris were less fortunate, for about this time someone cut down their nest-tree to take their young. While the tityras reared a second brood in the same hole as the first, the pair of araçaris, which did not attempt to raise a second brood, sometimes lodged in the Pileated Woodpecker's hole so close by, to the continued annoyance of their neighbors. Again the tityras' nesting was a success. As the irony of fate would have it, the following year, in this same clearing, a pair of tityras and a pair of araçaris—I believe the same two pairs—nested together in another trunk, the tityras near the top in a hole made by Golden-naped Woodpeckers, the araçaris in a low hole made by the Guatemalan Ivory-billed Woodpecker. The araçaris' nest was early despoiled; but the tityras almost succeeded in bringing forth their brood before their cavity was torn open, apparently by a mammal. Despite the araçaris' nest-robbing proclivities, I have rarely known them to pillage the homes of their

nearest neighbors, at least not of those that breed in cavities. In 1943, a pair of tityras and a pair of araçaris successfully reared families in the same trunk.

After the tityras' second brood had taken wing in late June of 1936, I found the parents guarding them among the trees at the edge of the clearing. When a long-tailed, brown Squirrel Cuckoo (*Piaya cayana*) passed heedlessly by, they darted at the big, harmless wayfarer and knocked several feathers from its wing, so aggressive had they become in defense of their offspring. The Squirrel Cuckoo was probably as surprised by this rude conduct as myself; for I cannot recall any other occasion when a tityra so mistreated another bird, of its own or of a different kind.

SUMMARY

1. The Costa Rican Tityra (*Tityra semifasciata costaricensis*) is found in pairs throughout the year; but even during the breeding season other individuals travel in small flocks, composed largely of males, which considerably outnumber the females. These unmated males may follow the female about by twos or threes while she seeks a nest-site, and at times invade the territory of a mated pair at the height of the breeding season.

2. The tityra nearly always nests in high cavities in dead or more rarely living trees, preferring those made by the smaller woodpeckers. Rarely it nests in crannies between the broad bases of the petioles of palm trees.

3. Potential nest-sites are examined by the mated pair many months in advance of the breeding season.

4. The nest-cavity is partially filled with a loose litter of dead leaves, fine twiglets and dry inflorescences, all gathered among the tree-tops. The female builds the nest with little or no help from the male, which often carries material to the doorway, but usually lets it drop to the ground or carries it away again.

5. The single nest which could be reached contained two eggs, which were covered by the litter of dead leaves whenever the female was absent.

6. The female alone incubates; but the male is most attentive to her, escorting her to the nest and often going to look in. He sometimes brings food in anticipation of the hatching of the nestlings, but does not give it to his mate.

7. The female brings billfuls of dry leaves to the nest from time to time during the course of incubation; and even after the eggs have

hatched, both parents occasionally bring such material, either dropping it or taking it into the hole.

8. The nestlings are fed by both parents, each of which delivers the food itself. If the male, coming with a morsel, finds his mate in the nest, he holds it patiently for many minutes until she leaves. The nestlings' fare consists largely of winged insects, caterpillars and spiders. They remain in the nest at least 21 days and probably a few days longer.

9. In Costa Rica, the breeding season extends from late February or early March to June or July. A second brood is frequently reared, at times in the same hole as the first. Incubation of the second set of eggs may begin about two weeks after the departure of the first brood.

10. The tityra defends a nesting territory, but probably not a feeding territory. Even when sufficient holes are available, one almost never finds two pairs nesting in the same small clearing, and intruders are gently but firmly repelled. For more than three weeks, two pairs disputed the possession of a woodpecker hole in a tree that had several available holes. Although they made many feints of attack, the threatened individuals always moved away in time to avoid contact. No fighting was ever seen between these or any other tityras.

11. Tityras sometimes capture holes used for sleeping, or newly completed and intended for nesting, by the woodpeckers *Tripsurus pucherani* and *T. chrysauchen*. They continue to fill up the holes with litter until the woodpeckers grow tired of cleaning them out and carve new holes close by. No actual fighting between tityras and woodpeckers has been witnessed, nor have the tityras been known to capture holes that contained the woodpeckers' eggs or young.

12. Tityras may dispossess *Pteroglossus frantzii* of old holes made by the bigger woodpeckers and used as dormitories by the toucans. They employ the same expedient of filling the cavities with nest material during the absence of the larger birds. It may be several weeks before the toucans relinquish their dormitory to the tityras.

13. When nesting near the toucans, tityras at all times keep close watch over the larger birds. The female tityra sometimes exhibits strange, vacillating behavior at nightfall as she begins to incubate near the toucans, and again when she ceases to brood the nestlings.

14. On three occasions, the tityras successfully reared broods in the same trees where nest-robbing *Pteroglossus* bred or slept in neighboring holes.

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San Isidro del General
Costa Rica

BIRDS OBSERVED ON ESPIRITU SANTO, NEW HEBRIDES

BY WALTER E. SCOTT, U. S. ARMY

ON September 24, 1944, the author landed on Espiritu Santo, the New Hebrides, possibly even a stranger land than the New Caledonia he had just left some several hundred miles closer to Australia. But the birds of the two localities were considerably alike, so the knowledge gained in New Caledonia in the previous five months was of great value.

In the New Hebrides archipelago, Espiritu Santo is the largest island, with 875 square miles. It lies at approximately 15 degrees South Latitude, has a broad flat coastal plain and level plateaus several hundred feet above sea level, and a mountainous range rising to 6,195 feet in the northwestern part. According to 'Pacific World': "The climate is hot and humid throughout the year, more moderate along the coast. The wettest season is from November to May." That book also states that the forest vegetation extends to the beaches, including tropical hardwoods, fig trees, palms and tree ferns. With these facts, especially the "hot and humid," the author thoroughly agrees.

Because this one-man scientific expedition was sponsored by the U. S. Army (although without their knowledge), observations of birds were entirely restricted to the southeastern portion of the island. Likewise, time was limited and although opportunities for study presented themselves at every moment, it seemed, much too often they were neglected because of more important duties. However, work in reconnaissance and trail mapping and training in newly-opened

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jungle areas took the author out among the forest birds practically all of his 51 days on the island. Except for one day when watching shorebirds, binoculars were not available for use, but fortunately several bird specimens were secured from hunters and others, all of which were sent to the Milwaukee Public Museum.

The only reference available for this report is Dr. Ernst Mayr's 'Birds of the Southwest Pacific,' published by the Macmillan Company, New York, in 1945. Therein he states: "All literature on birds of the New Hebrides is either strictly technical or refers only to a single species." As this book was not yet available during the period of these field observations, the work was done without reference material in the field. Therefore, more detailed notes on all strange birds were taken, but many valuable facts could have been secured had previous knowledge been available. Mayr's lists of needed ecological and life-history data for South Pacific birds is a valuable feature of his book. They would have inspired much more complete field recording. Besides the evident dearth of knowledge of even common species in this area, some discoveries were not impossible. The Whitney South Sea Expedition of the American Museum of Natural History as recently as 1926 had found a new species of bird, the Thicket Warbler (*Cichlornis whitneyi* Mayr, 1933), in the primeval mountain forest above 2,400 feet on Santo. Birds of new subspecies or those not previously recorded for the area are a challenge to all students in the southwest Pacific.

Of the 54 native land and fresh-water birds listed by Mayr for this region (the New Hebrides and Banks Islands), 48 have been reported from Santo. The author recorded 31 of these and, in addition, two from adjacent islands and two kinds of shorebirds. Peculiarly, neither English Sparrows nor Indian Mynas were seen, but five of a species of introduced *Estrilda*, either the Red-browed Waxbill (*Estrilda temporalis* Latham) or Astrid (*Estrilda astrild* Linnaeus), were noted near Luganville. It should be mentioned here that even with binoculars it is not always possible to distinguish in the field between the three types of swiftlets or the two species of fantail flycatchers and white-eyes. Therefore, except when I was reasonably positive of the exact species, all other observations were attributed to what seemed to be the most common species of these groups, *i. e.*, the Glossy Swiftlet (*Collocalia esculenta uropygialis* Gray), the Collared Fantail (*Rhipidura fuliginosa brenchleyi* Sharpe) and the Yellow White-eye (*Zosterops flavifrons brevicauda* Murphy and Mathews).

Throughout this paper an attempt will be made to record observations especially in regard to the ecological and life-history questions listed by Mayr. As the author lived in a coconut plantation on what might be called the lower plateau, many of the bird records are from that locality. But frequent trips were taken through plantations of cocoa, coffee and coconut palms, mixed with groups of papaya, breadfruit and bananas, and surrounded by a lowland hardwood forest with towering crowns and an understory of smaller trees crowded with hanging vines. In this plantation region it was not uncommon to see acres of dead trees purposely 'ringed' to kill them and dry out the vegetation below preparatory to clearing. Only ten days were spent in what might be called natural jungle forest at an elevation of 750 to 1,000 feet where only trails used by the natives were previously known. Here were huge banyan-like trees with hundreds of roots, clumps of bamboo so thick they were impenetrable, and a sea of vegetation forming a wall on all sides of roads and openings that could be inviting only to a bird or a naturalist. Another type of habitat was visited only occasionally—the grassland and garden openings near the sea beaches. Birds preferring certain of these areas, or restricted to them, will be so noted under four habitat groups, that I will call H1, H2, H3 and H4: (H1) coconut plantations, (H2) lowland mixed plantation and open forest, (H3) higher natural jungle forest and (H4) grassland, beach and cleared roadway.

Most roadways on Santo pass through coconut plantations for miles on end except in inhabited beach areas where there are some grassland clearings. Many roads built recently now pass through native jungle giving the impression of a canyon wall on either side. Out of these dark interiors birds dash to cover on the other side before passing vehicles. These new roads should prove inviting to future scientific expeditions wishing to study the ecology and habits of little-known species of this and other South Pacific islands.

Although the above description of the island of Espiritu Santo and the areas in which these birds were seen seems inadequate, further details will have to be mentioned when necessary in regard to the individual species. I append the more important records for September 24 to November 13, 1944, inclusive, for the southeastern portion of the island and within a radius of twenty-five miles of Luganville, the principal settlement. The two shorebirds observed are listed at the end so as not to interrupt the order of land and fresh-water species. Specific dates will be given only when deemed advisable as on migratory birds or more important observations.

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REEF HERON (*Demigretta sacra* Gmelin).—Birds in the gray phase were observed on several occasions. A single bird was seen over the Sarakata River, and at other times in November one or more were noted over high trees near Surundu Bay where it seemed that a rookery could have been located at a point where a stream entered the sea. There was no opportunity to investigate further. No white-phase individuals were noted.

TANNA FRUIT DOVE (*Ptilinopus tannensis* Latham).—Records of this bird could be confused with the similar but smaller Red-bellied Fruit Dove (*Ptilinopus greyii* Bonaparte) which is also found on Santo, but of five birds seen on four different days from October 12 to 17, three certainly were of the larger Tanna Fruit Dove. On October 12, two took off from treetops in a lowland wooded area near the plantations in such a hurry that they broke branches as they flew, giving several loud, piercing call notes at the same time. As they usually flush from treetops in H2 and seem quite wary, they never could be inspected carefully.

PACIFIC PIGEON (*Ducula p. pacifica* Gmelin).—Throughout the period of these field observations, this bird was seen five times in H2 and four times in H3. Seldom were single birds observed, but usually two or three and once four together, and always on the wing, flying above treetop level or through forest openings. Going in a straight line with constant wing beat, they looked sleek in their contrasting gray-black color. Most noticeable in flight was the gray head and neck, while the rest of the body looked darker throughout. A pair of wings believed to have been from this or the White-throated Pigeon (*Columba vitiensis leopoldi* Tristram) were found on the edge of a coconut plantation. Allowing for a body width of six inches, the bird would have a 24-inch wingspread.

RUFOUS-BROWN PHEASANT DOVE (*Macropygia m. mackinlayi* Ramsay).—Seen only three times as single birds flew across the road, startled by passing trucks, but it is impossible to forget their long tail and thrasher-like appearance. In all cases the situation was a roadway through impenetrable substage of thick forest, but somehow this bird would dash across the road at a low level, swoop up into the tangle of vines and branches on the other side, and disappear.

GREEN-WINGED GROUND PIGEON (*Chalcophaps indica sandwichensis* Ramsay).—This was one of the most common birds on the island, evidently favoring native gardens, plantations and open forest habitat. None were seen in H3, even in recently created openings. As this observation period was supposedly during nesting season, it is surprising that no nests were found. The birds were almost always observed as singles and most frequently in H2. They were the favorite prey of hunters and easily taken. In gardens and camp areas where they were not molested, the birds could be approached to within 20 feet. A group of four were seen feeding together on September 25 and a group of three on October 27. A female secured from a hunter on October 12 had six tomato-like seeds and a hard pea-like seed in its stomach.

SANTA CRUZ GROUND DOVE (*Gallicolumba sanctaecrucis* Mayr).—Only one bird was seen that must be attributed to this rare species. It flew across the road in front of a truck in lowland forest and was recognized at once as a new bird, "dark chocolate brown" in color.

COCONUT LORY (*Trichoglossus haematodus massena* Bonaparte).—This was one of the most common birds and was found in every habitat visited. However, in the jungle forest of H3, it was noted only three days of a possible eight. It was most common in coconut plantations and slightly less common in adjacent open

lowland forest. From September 25 to October 29, five flocks were noted averaging five birds to a flock. Birds in twos as if paired were observed about twenty times between September 25 and October 18, and frequently, especially near mid-October, they were chasing each other over the coconut trees amid screams that accentuated their often-repeated piercing cry.

FAN-TAILED CUCKOO (*Cacomantis pyrrhophanus schistaceigularis* Sharpe).—Only twice, October 20 and 29, was this resident cuckoo observed in H2. The first time, it was watched while it sat on the top of a medium-sized tree; rather, it was doing most of the watching for, as with cuckoos elsewhere, it was peering from behind various branches, wary and inquisitive of the nature of the intrusion. In the field it was compared with a thrasher, with "browner underparts," while the white pattern on the tail clearly identified the bird. As was so often the case, other work had to be done and the bird could not be followed or studied.

BARN OWL (*Tyto alba interposita* Mayr).—On September 27, a hunter killed one of these owls near camp in lowland forest, H2, at 3:30 P. M. Later, after much searching among the huge buttresses of what was probably the tall tree, *Elaeocarpus hortensis*, the specimen was found and the skin saved. The bird proved to be a male and had a rat four inches long in its stomach, of which the head was partly digested, while the tip of the tail still protruded from the owl's mouth. One other owl was seen in this same area at twilight on October 12, but this species is undoubtedly more common than the records indicate.

VANIKORO SWIFTLET (*Collocalia v. vanikorensis* Quoy and Gaimard).—Swiftlets all gray or dark with no indication of a white rump or under parts, were so noted and later attributed to this species. They were found hawking for insects in open places of all habitats except the recently created openings in the jungle forest, and proved to be most common near the sea or in lowland forest areas. Often this bird was seen in mixed groups with the Glossy Swiftlet (*Collocalia esculenta uropygialis* Gray), but it was observed to be the highest flyer of all swiftlets here. Mixed groups of as many as forty birds were not uncommon in openings of H2. They are among the most common birds on Santo.

GLOSSY SWIFTLET (*Collocalia esculenta uropygialis* Gray).—This bird was probably the most common in numbers seen on Santo. In H2 it was regularly found mixed with *vanikorensis* as previously stated. In loose groups these birds would swoop down to the tops of bushes to catch insects and then swing higher to miss the tree border of the forest opening. Their numbers would vary from several birds to the usual twenty or more. However, in H3, the newly created openings of the true jungle forest, where huge banyan trees were occasionally left because their roots discouraged even the engineers, was the home of the Glossy Swiftlet. Notes taken October 2 describe them as follows: "Also the common swiftlet—all today were white-bellied and white-rumped and had glossy backs." Other days, however, their color was not as clearly seen, but it is probable that this was the only swiftlet found in that area. Throughout the day, especially in the morning and evening, the air seemed to be full of these birds swooping and gliding over the forest opening, and usual numbers here would exceed fifty birds to twenty acres while hundreds could be counted in a day. This report on the swiftlets would not be complete without the following observation: "On October 12 saw a medium-sized butterfly actually chase, or follow, all the intricate movements of a swiftlet for about 30 yards!"

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WHITE-COLLARED KINGFISHER (*Halcyon chloris santoensis* Mayr).—Only 16 of these birds were found on eight different days and always in H2—the lowland forest. None were observed in the true jungle at a higher elevation. These birds were not too common even in their favorite haunts (possibly because of an artificially heavy and indiscriminate hunting pressure), for on October 16, a full day was spent in such habitat without seeing a single one.

MELANESIAN GRAYBIRD (*Coracina caledonica thilenii* Neumann).—This crow-like cuckoo-shrike was seen frequently enough to be called common, and most often in H3 of higher elevation jungle forest. However, singles and twos were observed several times in H2. On four occasions the birds were seen in pairs, and their undulating direct flight was noted. Their whistled call note was very loud and much like the sound of a sergeant's whistle. It was heard throughout the day, even shattering the high-noon silence of the steaming-hot jungle. One was observed while it sat on the very top branches of a high tree in lowland forest while it gave its piercing, whistled call. On October 5 and 6, two birds attributed to this species were seen at fairly close range but without binoculars. On both occasions a white eye-ring was noted in contrast to the otherwise all-dark plumage. This characteristic cannot be accounted for by any description of the bird and must refer to another species or a local attribute.

BROAD-BILLED FLYCATCHER (*Myiagra caledonica marina* Salomonsen).—Although records of this bird indicate that it was recorded only five times, almost always in coconut plantations or open lowland forest near such plantations, it was observed more often and could be considered common locally in this habitat. The male which dominated the coconut trees near camp was frequently seen in early morning on what seemed to be a favorite perch. These birds dart out after insects like a true flycatcher, but more often they were seen nervously investigating the thick crowns of coconut trees about 25 feet up, as if seeking insects. Because of the female's reddish upper breast and throat in contrast to the male's entirely white and black colors, it was always possible to identify the sex. Four males and two females were recorded. One of their calls was a sharp, low note followed by a high note, while the song, although undescribed, was sweet.

BUFF-BELLIED FLYCATCHER (*Neolalage banksiana* Gray).—One adult and an immature of this species were seen on October 18 in the substage of lowland forest near coconut plantations. The birds responded to 'squeaking' and seemed fairly inquisitive. Another bird, which answered this form of invitation in the substage of heavy jungle in H3, met the description of an adult of this species.

GOLDEN WHISTLER (*Pachycephala pectoralis intacta* Sharpe).—About fifteen of these beautiful songsters were heard and seen on ten different days. They were found most commonly in H3, but also frequently in open lowland forest where they favored the substage but also stayed in the higher parts of trees. According to the location of songs in H3, it seemed that they had definite territories. They responded to an imitation of their song with great interest and actually seemed to try to outsing their new rival. The winner was given credit in the record as "a wonderful tireless singer."

SILVER-EARED HONEY-EATER (*Lichmera incana flavotincta* Gray).—This bird is, according to Mayr, common in coconut plantations and garden areas in the central New Hebrides as far north as the island Malekula, which is not far south of Santo, but evidently it had not as yet been reported from here. The writer was very familiar with the song and habits of the subspecies *incana* on New Caledonia, and

therefore the following records of this bird on Santo were not discarded. On September 26 and various other days this bird was the first to sing its beautiful flute-like song at the camp in a coconut plantation. The day before, a fleeting glance at a bird was attributed to this species. The song, however, is so distinctive it could hardly be mistaken. On October 18, in a plantation garden area, the following record was taken: "One larger olive and yellowish bird, larger by far than the white-eyes." Although these data are not positive without a specimen, the writer believes that this honey-eater was at least heard on Santo several times.

YELLOW WHITE-EYE (*Zosterops flavifrons brevicauda* Murphy and Mathews).—All white-eyes observed were assigned to this kind unless clearly of the next species. They were found in all habitats, although not as commonly in the jungle of H3 as in other areas and especially in lowland open forest and plantations. That this is the most numerous bird on Santo is undoubtedly true, for sizeable groups were often seen, and on October 16 they were even listed as numerous. However, unlike experience on New Caledonia, here it was not found that other birds moved with the white-eyes on their feeding expeditions, but the season or other factors may have been responsible for this observation.

GRAY-BACKED WHITE-EYE (*Zosterops lateralis vatensis* Tristram).—On only three days, and always in H2, a total of six of these birds were seen and definitely identified. No doubt others were recorded as Yellow White-eyes because of the difficulty of distinguishing them without binoculars.

PACIFIC GOLDEN PLOVER (*Pluvialis dominica fulva* Gmelin).—This and the following species were found on the same large crop field of several hundred acres in H2. Much of the field had been recently ploughed and planted and there were numerous small wet spots. But although these birds were feeding and resting on the same field, they did not necessarily associate in feeding or in flight when flushed. On October 17, a few were seen, but on the next day, when a count and study was made with binoculars, about fifty birds were recorded. Those birds that seemed in fullest breeding plumage, with black under parts and most golden on the back, were about one to eight others that were much lighter throughout. The largest group consisted of thirty birds which stayed together, but they scattered widely in feeding. When startled, they gave their characteristic cry and flew low to the ground as a loose group for about 100 yards, to alight and feed again. Those in the darkest plumage seemed to stay pretty much to themselves. The last time a few of these birds were seen here was on October 19.

TURNSTONE (*Arenaria interpres* Linnaeus).—A single one was first seen at the crop field described above, on October 16. On the next day about fifty were observed in groups feeding on the ploughed field. When flushed, they gave their usual call note as they quickly organized into a tight group taking off quite high and circling and landing much farther away than did the plovers. On October 18, the last day they were seen, a small flock was watched with binoculars at close range as the birds evidently captured insects between rows of radish plants! All of these birds were in the winter plumage. It should be understood that both this and the foregoing species may have frequented this area both before and after the recorded dates which were limited by circumstances.

Oahu
Hawaii
July 12, 1945

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SOME NOTES ON TRINIDAD BIRDS

BY PHILLIPS B. STREET

THE following observations were made during the period from October, 1943, to June, 1944, when the writer had the good fortune to be stationed in Trinidad as supply officer of a blimp squadron. They are presented primarily to record the presence of a few of the rarer species and secondarily with the thought that they might be of some small value to anyone who may in the future undertake the publication of a handbook on the birds of this island so rich in its avifauna. Such a book would be much appreciated by the ornithologist and West Indian traveller, for oft-visited Trinidad is the only island, except for its neighbor, Tobago, not adequately covered by a ready reference guide.

The observations were of necessity very incomplete due to the fact that my primary occupation was in the service of the Navy, and birds could be studied only in off-hours. Transportation, too, was a problem until spring, when the arrival of some jeeps made field trips possible, and the lack of any handy reference guide resulted in several species, particularly among the hummingbirds, going unidentified.

Some of the localities mentioned may be unfamiliar to one who has not visited the island since the advent of the war. Carlsen Field, where I was stationed, is situated on the Southern Main Road about midway between Port of Spain and San Fernando. Fort Read and Waller Field, which comprise the new army installations, are just south of the mountains, near Arima. The Naval Air Station is at Chaguaramas, a few miles north of Port of Spain.

With the exception of frequent walks around the Carlsen Field area, which area was quite thoroughly kept under observation throughout the length of my stay, the observations listed are the result of several field trips taken with Mr. G. D. Smooker—one to the Caroni Swamp and the others in the northern mountains. I did not visit the southern parts of the island nor the islands of Monos and Chacachacare, which islands contain many interesting forms, and trips to these areas would have made possible a more complete list.

Mr. Smooker, a resident of Trinidad for many years and now returned to England, is the co-author with Sir Charles Belcher of a paper, 'Birds of the Colony of Trinidad and Tobago,' which was published serially in the 'Ibis' from July, 1934, to July, 1937. I was indeed fortunate in being able to make his acquaintance and learn the more difficult Trinidad birds under his able tutelage.

The scientific names given are, with few exceptions, those of Peters's 'Check List of Birds of the World' and Hellmayr's 'Catalogue of Birds of the Americas.' Names of the North American migrants are those of the A. O. U. Check-List. The vernacular names used are those given in Hellmayr's work and, for the species not yet completed in that work, those of Belcher and Smooker.

Crypturellus soui andrei (Brabourne and Chubb), ANDRE'S PILEATED TINAMOU.—One heard calling in the valley east of Morne Coco, March 13; four in the same vicinity, April 16; one was heard near St. Joseph at St. Benedict's Monastery, June 4.

Podilymbus podiceps antarcticus (Lesson), PIED-BILLED GREBE.—Five birds of this southern race were seen on May 24 in Caroni Swamp, where it is known to breed.

Pelecanus occidentalis Linnaeus, BROWN PELICAN.—Seen commonly at all times about the coast.

Sula sula sula (Linnaeus), RED-FOOTED BOOBY.—Common along the rocky portions of the coast. It was first noted from a blimp along the east coast near Toco on November 7. Large numbers, together with Brown Boobies, were seen from a blimp on the rocks at the northeast end of Tobago on November 15.

Phalacrocorax olivaceus olivaceus (Humboldt), BRAZILIAN CORMORANT.—Caroni Swamp, five on May 24.

Fregata magnificens rothschildi Mathews, FRIGATE BIRD.—Noted commonly everywhere along the coast at all times.

Ardea cocoi Linnaeus, COCOI HERON.—One seen in a stream at Waller Field on May 30; uncommon.

Butorides striatus striatus (Linnaeus), BLACK-CROWNED HERON.—Carlsen Field, two on March 22. Noted in small numbers every day thereafter that I visited the stream running through the center of the reservation. Caroni Swamp, very common—thirty or more seen on May 24.

Florida caerulea (Linnaeus), LITTLE BLUE HERON.—Common in all swampy areas. Caroni Swamp, four on October 30; four immatures and two adults at Carlsen Field on March 30; seen here often thereafter. Caroni Swamp, 30 on May 24.

Casmerodius albus egretta (Gmelin), AMERICAN EGRET.—San Juan, two on October 30. Occasionally seen in Caroni Swamp during November; none were noted during the winter. Caroni Swamp, 20 on May 24, and 12 on June 4.

Leucophoyx thula thula (Molina), SNOWY EGRET.—Only seen twice, May 24 and June 4, in Caroni Swamp, a single bird each time.

Hydranassa tricolor rufimentum Hellmayr, RED-NECKED HERON.—Caroni Swamp, one on May 23, and four on the following day.

Anas discors Linnaeus, BLUE-WINGED TEAL.—Two of our officers brought back one bird shot by them in Caroni Swamp on December 5 and reported the presence of "hundreds." Caroni Swamp, four on May 24.

Cathartes aura ruficollis Spix, RED-NECKED TURKEY VULTURE.—Fairly common, but not in such numbers as the Black Vulture. None of the much rarer orange-headed variety were seen.

Coragyps atratus foetens (Lichtenstein), BLACK VULTURE.—Common, and especially numerous about the dumps on the outskirts of Port of Spain where hundreds gather.

Elanoides forficatus yetapa (Vieillot), SWALLOW-TAILED KITE.—One seen near Valencia along the Cuare River, May 24; Blanchisseuse Road near Arima, one on May 28.

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Ictinia plumbea (Gmelin), PLUMBEOUS KITE.—One noted along the Piarco-Ft. Read road on May 24. A pair at the same place, May 30.

Buteo albicaudatus colonus, Berlepsch, WHITE-TAILED BUZZARD.—One soaring over the Blue Basin, April 16.

Buteo albonotatus abbreviatus Cabanis, SMALL BLACK BUZZARD.—Scotland Bay, one on May 23.

Asturina nitida nitida (Latham), SHINING BUZZARD-HAWK.—Blue Basin, one on April 16; Carlsen Field, one on May 21; Cuare River, one on May 24.

Buteogallus anthracinus cancrivorus (Clark), BLACK HAWK.—Macqueripe Bay, one, April 9; Blue Basin, two, April 16.

Pandion haliaetus carolinensis (Gmelin), OSPREY.—Two birds were seen on October 30 between Port of Spain and the Naval Air Station.

Rallus longirostris longirostris Boddaert, TRINIDAD CLAPPER RAIL.—Caroni Swamp, one, May 24.

Gallinula chloropus galeata (Lichtenstein), BRAZILIAN GALLINULE.—Caroni Swamp, three, May 24 and one, June 4.

Jacana spinosa jacana (Linnaeus), JAÇANA.—I noted 25 or more at Caroni, October 30. A few birds were seen at Carlsen Field in December and often thereafter. I noted two immatures among those seen on April 23. Birds were seen often at Caroni and in the marshy fields near San Juan.

Charadrius hiaticula semipalmatus Bonaparte, SEMIPALMATED PLOVER.—Chaguaramas, four on April 26 and three on May 23.

Charadrius collaris Vieillot, COLLARED PLOVER.—Carlsen Field, a pair on May 24; seen again in the same field on May 28.

Tringa solitaria subsp., SOLITARY SANDPIPER.—Mayaro Bay, four on October 25; Carlsen Field, 15 on March 22. Noted commonly until April 23 when 15 were seen; none thereafter.

Actitis macularia (Linnaeus), SPOTTED SANDPIPER.—One at Carlsen Field, April 6.

Totanus melanoleucus (Gmelin), GREATER YELLOW-LEGS.—Several were heard flying over Carlsen at night in November, 1943. Carlsen, 20 on March 22, remaining into April in about the same numbers. Carlsen Field, three on April 23. One was seen at Ft. Read on May 24, which seems like a late date for a bird to be remaining so far south.

Totanus flavipes (Gmelin), LESSER YELLOW-LEGS.—San Juan, four on October 30; Carlsen Field, two on March 29, three on April 6, two on April 23, and two on May 21, another late date.

Himantopus mexicanus (Müller), BLACK-NECKED STILT.—I saw one bird on the edge of Caroni Swamp, June 4.

Phaetusa simplex simplex (Gmelin), GREAT-BILLED TERN.—Caroni Swamp, seven on May 24, and eight on June 4; Point-a-Pierre, two on May 27. Piarco, one on May 28. Caroni Estate, 12 on June 2.

Sterna hirundo hirunda Linnaeus, COMMON TERN.—A flock of twelve noted off Mucarapo, Port of Spain, May 28.

Columba rufina tobagensis Cory, PALE-VENTED RUFOUS PIGEON.—One noted at Carlsen Field, June 5.

Columbigallina talpacoti rufipennis (Bonaparte), RED-WINGED TALPACOTI DOVE.—Very common in open, scrubby country.

Columbigallina minuta minuta (Linnaeus), PLAIN-BREASTED GROUND DOVE.—Very common throughout the island.

Leptotila verreauxi zapluta Peters, VERREAUX'S WHITE-FRONTED DOVE.—Morne Coco, common. Noted on April 16.

Leptotila rufaxilla hellmayri Chapman, HELLMAYR'S GRAY-FRONTED DOVE.—Observed at Carlsen Field on four occasions: April 1, one; April 19, four; April 29, four; and May 26, two.

Oreopeleia montana (Linnaeus), RUDDY QUAIL DOVE.—Morne Bleu, one, March 26.

Forpus passerinus virdissimus (Lafresnaye)., GREEN PARROLET.—A very common bird in the lower parts of the island. A flock of 12 was first noted in the mangroves along the edge of Caroni Swamp on October 30. A pair was seen at Carlsen on March 30, apparently searching for nesting holes. On April 22 I noted 12 birds and two nests at Carlsen; on April 23, fifteen birds and another nest. The birds appeared to be laying. Five nests in all were discovered, and all were in holes in trees which were either too tall or too rotten to climb.

Pionus menstruus (Linnaeus), BLUE-HEADED PARROT.—Two were noted by Smooker and myself along the Cuare River, May 24.

Amazona amazonica tobagensis Cory, TOBAGO ORANGE-WINGED PARROT.—About 25 noted from a blimp on a trip across the jungle to the east coast and return, November 7. While in a blimp flying through the mountains of the north coast on November 15, we encountered flocks totaling 200 or more parrots, most of which were undoubtedly of this species. Cuare River, four, on May 24.

Piaya cayana insulana Hellmayr, TRINIDAD SQUIRREL CUCKOO.—Morne Coco Road, two, March 13; Carlsen Field, one, May 26; Piarco-Ft. Read Road, one, May 30.

Piaya minuta minuta (Vieillot), LITTLE CUCKOO.—Carlsen Field, one, April 22.

Crotophaga ani Linnaeus, ANI.—A very common species at Carlsen Field and throughout the island.

Tapera naevia naevia (Linnaeus), STRIPED CUCKOO.—The natives call this bird "Wife Sick." At least six were heard calling on May 24, while we were boating through Caroni Swamp.

Glaucidium brasilianum phaloenoides (Daudin), TRINIDAD FERRUGINEOUS PIGMY OWL.—One was heard calling along the Morne Coco Road on March 14; one at Carlsen Field, March 22.

Nyctidromus albicollis albicollis (Gmelin), CUIEJO OR PAURAQUE.—Two were heard calling their "Who-are-you" at Carlsen on February 12. The birds were frequently heard during the next month. One was heard at the Naval Air Station, April 12.

Chaetura chapmani chapmani Hellmayr, CHAPMAN'S SWIFT.—Morne Bleu, six, May 28.

Chaetura cinereiventris lawrencei Ridgway, LAWRENCE'S SWIFT.—Morne Bleu, 20, March 26; numerous at the same place on May 28.

Chaetura spinicauda spinicauda (Temminck), SPINE-TAILED SWIFT.—Morne Bleu, five, May 28.

Chaetura brachyura brachyura (Jardine), SHORT-TAILED SWIFT.—Not observed until March 15, when a flock of at least 50 was seen in Port of Spain. The species was often noted in April and May in Port of Spain, the mountains, and at Carlsen.

Glaucis hirsuta insularum Hellmayr and Seilern, TRINIDAD HERMIT.—Carlsen Field, one, April 19; Morne Bleu, two, May 28.

Anthracothorax viridigula (Boddaert), GREEN-THROATED MANGO.—Five on March 26 on Blanchisseuse Road, where they were apparently common in the mountains.

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Anthracothorax nigricollis nigricollis (Vieillot), VIOLET-TAILED MANGO.—A female on her nest on May 28 near the Ft. Read entrance to the Blanchisseuse Road was thought by Smooker to be this species. He believes this species to be commoner in the lowlands than the preceding. The females of both are very similar in the field, and many are seen about Carlsen.

Chrysolampis mosquitus (Linnaeus), RUBY AND TOPAZ HUMMINGBIRD.—Blanchisseuse Road, two on March 26.

Chlorostilbon caniveti caribaeus Lawrence, CARIBBEAN EMERALD.—Blue Basin, one, April 16.

Amazilia chionopectus chionopectus (Gould), WHITE-BREASTED EMERALD.—Piarco-Ft. Read Road, one, May 24.

Megaceryle alcyon alcyon (Linnaeus), EASTERN BELTED KINGFISHER.—One was seen near the Naval Air Station, Chaguaramas, on October 22.

Chloroceryle americana croteta Wetmore, GREEN KINGFISHER.—A pair was first seen on March 24 along the little stream running through the center of our base at Carlsen. A single bird was noted at the same spot, April 22.

Chloroceryle aenea aenea (Pallas), LEAST GREEN KINGFISHER.—This tiny bird was seen only once, May 24, diving into a pond along the Piarco-Ft. Read back road.

Galbula ruficauda ruficauda, Cuvier, RUFOUS-TAILED JACAMAR.—Three were noted at Carlsen Field on April 1 and were seen often in the same spot thereafter. A nest was found near by on May 26 with young calling from inside the bank. Another pair was seen along the Cuare River road on May 24 at their nesting hole.

Ramphastos vitellinus Lichtenstein, SULPHUR-AND-WHITE-BREASTED TOUCAN.—One or two were heard calling from the Blanchisseuse Road on March 26. Piarco-Ft. Read Road, one; Cuare River, one, May 24. Blanchisseuse Road, two, May 28. Ft. Read, two; Piarco-Ft. Read Road, one, May 30.

Piculus rubiginosus trinitatis Ridgway, GREEN WOODPECKER.—Las Lomas, one, April 20.

Ceophloeus lineatus lineatus (Linnaeus), LINEATED WOODPECKER.—I saw one of these fine birds in the big trees on the Waller Field reservation on May 30.

Veniliornis kirkii kirkii (Malherbe), KIRK'S RED-RUMPED WOODPECKER.—Carlsen Field, one on March 24, and one on April 6. Morne Bleu, four on March 26.

Xiphorynchus susurrans susurrans (Jardine), COCOA WOOD-HEWER.—Carlsen Field, one, November 20; Morne Coco Road, two, March 13; Blanchisseuse Road, two or more calling, March 26; Blue Basin, one, April 16.

Dendrocincla meruloides meruloides (Lafresnaye), OCHREOUS-BELLIED DENDROCINCLA.—Carlsen Field, one on March 24, and two on May 21; Blanchisseuse Road, one, March 26; Morne Bleu, one, April 28.

Synallaxis albescens nesiotis Clark, CLARK'S WHITE-THROATED SPINE-TAIL.—A pair of these elusive birds showed themselves long enough to be identified in the underbrush along the border of the Carlsen reservation, May 26.

Certhiaxis cinnamomea cinnamomea (Gmelin), YELLOW-THROATED SPINE-TAIL.—Very common in Caroni Swamp, where 25 or more were seen on May 24. One was nest-building.

Sakesphorus canadensis trinitatis (Ridgway), TRINIDAD BLACK-CRESTED ANT SHRIKE.—Carlsen Field, one on April 23; Caroni Swamp, four on May 24.

Thamnophilus doliatus fraterculus Berlepsch and Hartert, VENEZUELAN WHITE-BARRED ANT SHRIKE.—A common species throughout the island at all times; more often heard than seen.

Formicarius analis saturatus Ridgway, RUFOUS-NECKED ANTTHRUSH.—The Cock-of-the-Woods is common in the forest country where, as in the previous species, it is seldom seen but often heard. Blanchisseuse Road, two, March 26, and four on May 28; Morne Coco Road, three, April 16; Cuare River, two, May 24; St. Benedict's Monastery, two, June 4.

Procnias averano carnobarba (Cuvier), BLACK-WINGED BELL-BIRD.—I heard five calling, May 28, and had an excellent view of one male calling from a dead branch of a forest tree below us on Morne Bleu. Maracas Bay Road, two, June 2; St. Benedict's Monastery, one, June 4.

Pipra erythrocephala erythrocephala (Linnaeus), GOLDEN-HEADED MANAKIN.—Morne Bleu, two, March 26; Cuare River, one, May 24.

Manacus manacus trinitatis (Hartert), TRINIDAD MANAKIN.—Cuare River, one, May 24; eight or more May 28, along the southern part of the Arima to Blanchisseuse Road, where I heard the peculiar clicking sound of the wings during courtship.

Fluvicola pica pica (Boddaert), WHITE-SHOULDERED WATER-TYRANT.—Often noted from the road which borders the Caroni Swamp, and twenty were observed on May 24 on a boat trip through the swamp.

Arundicola leucocephala (Linnaeus), WHITE-HEADED MARSH-TYRANT.—This common species was seen frequently wherever swampy land provided the proper habitat. It was first noted October 22 in rice fields south of San Juan. Common along the Caroni Swamp road.

Muscivora tyrannus (Linnaeus), SWALLOW-TAILED FLYCATCHER.—First noted October 22 near Caroni and seen commonly around the swamp until November, when the southern migration commences. Noted next on May 21, upon my return from a two-weeks leave in the United States. From that date until my departure it was the commonest bird to be seen from the roads from Carlsen to Port of Spain with seldom less than a hundred being noted each trip.

Tyrannus melancholicus despotes (Lichtenstein), LICHTENSTEIN'S KINGBIRD.—Seen upon my arrival and extremely common throughout the island at all times.

Tyrannus dominicensis vorax, Vieillot, LARGE-BILLED KINGBIRD.—Two were observed at Carlsen Field on March 19.

Legatus leucophaius leucophaius (Vieillot), STRIPED FLYCATCHER.—Carlsen Field, two on May 25; noted often thereafter. Blanchisseuse Road, one, and Arima, one, May 28.

Myiodynastes maculatus maculatus (Müller),—STREAKED FLYCATCHER.—Blanchisseuse Road, two, May 28.

Megarynchus pitangua pitangua (Linnaeus), BROAD-BILLED FLYCATCHER.—Morne Coco Road, two, March 13; Blanchisseuse Road, a pair and a nest in an immortelle tree, incubating, May 28.

Pitangus sulphuratus trinitatis Hellmayr, TRINIDAD KISKADEE FLYCATCHER.—The Kiskadee seems to be the best known bird in Trinidad. It was noted commonly on the base at arrival and was seen or heard perhaps every day thereafter. A nest with an incubating bird was found on May 22. Another nest contained young on May 30.

Myiarchus tyrannulus tyrannulus (Müller), GUIANAN CRESTED FLYCATCHER.—Smooker and I noted a pair above Arima on the Blanchisseuse Road on May 28. They are considered rare.

Myiochanes cinereus bogotensis (Bonaparte), CARIBBEAN PEWEE.—Blanchisseuse Road, one on March 26, and five on May 28; one nest with bird incubating on the latter date. Cuare River, one, May 24.

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Myiophobus fasciatus fasciatus (Müller), BANDED FLYCATCHER.—Carlsen Field, one, March 24; two, May 26; Morne Bleu, one, May 28.

Elaenia flavogaster flavogaster (Thunberg), YELLOW-BELLIED ELAENIA.—A pair was seen regularly at Carlsen. One bird was observed at Caroni on May 24. A nest and incubating bird were found near Arima on May 28.

Progne chalybea chalybea (Gmelin), WHITE-BELLIED MARTIN.—Reportedly quite common, but only observed once by me, in the valley below Blue Basin, on April 16, when eight were noted.

Stelgidopteryx ruficollis aequalis Bangs, CARIBBEAN ROUGH-WINGED SWALLOW.—The commonest swallow about the base at all times. It was seen both here and at Caroni in large numbers on many occasions.

Pygochelidon cyanoleuca cyanoleuca (Vieillot), BLUE-AND-WHITE SWALLOW.—Seen commonly at times. About 100 birds were on the telephone wires at the Caroni Estate at times in October. On May 24, over 300 were noted at Caroni and along the Caroni-Ft. Read Road. Only seen once at Carlsen, on May 26, when I counted 15.

Hirundo rustica erythrogaster Boddaert, BARN SWALLOW.—Caroni Swamp, three on April 19 and a flock of fifteen on April 26. This seems like a late date for this early migrant to be so far south. None were noted during the winter. Waller Field, one, April 20.

Thryothorus rutilus rutilus (Vieillot), RUFOUS-BREASTED WREN.—Morne Bleu, one singing on May 28.

Troglodytes musculus clarus Berlepsch and Hartert, PALE-BELLIED HOUSE WREN.—First noted at Carlsen on October 15, singing, and seen and heard commonly throughout the more inhabited parts of Trinidad. It was not a noticeable bird during the winter months but commenced singing again in late March and early April.

Mimus gilvus tobagensis Dalmas, TOBAGO MOCKINGBIRD.—Formerly rare, this Mockingbird is now well established around Port of Spain, where I saw them often. Also noted at Arima on March 26, at Carlsen April 15, and St. Joseph, June 4.

Turdus albicollis phaeopygoides Seebohm, TOBAGO GRAY-RUMPED THRUSH.—One seen above Arima on the Blanchisseuse Road on March 26.

Turdus nudigenis nudigenis Lafresnaye, BARE-EYED THRUSH.—Common and widely distributed. On May 21 I noted nineteen at Carlsen. On May 26 a nest with young was found.

Turdus fumigatus aquilonalis (Cherrie), TRINIDAD THRUSH.—This Cocoa Thrush is abundant in the cocoa groves. Three nests were discovered along the Blanchisseuse Road on March 26 in banks alongside the road, one containing three eggs and the others being built.

Vireo virescens vividior Hellmayr and Seilern, CARIBBEAN VIREO.—Carlsen Field, one, May 22; Blanchisseuse Road, six, singing, on May 28.

Hylophilus aurantiifrons saturatus (Hellmayr), EASTERN OCHER-FRONTED HYLOPHILUS.—Morne Bleu, four, May 28.

Cyclarhis gujanensis flavipectus Sclater, YELLOW-BREASTED PEPPER-SHRIKE.—Common. Heard or seen on every field trip. Perhaps the most thoroughly distributed bird in Trinidad, being found wherever there are trees.

Chlorophanes spiza spiza (Linnaeus), GREEN HONEY CREEPER.—Two males and a female of this lovely species seen along the Blanchisseuse Road, May 28.

Cyanerpes caeruleus longirostris (Cabanis), TRINIDAD HONEY CREEPER.—Cuare River, six, May 24.

Dacnis cayana cayana (Linnaeus), CAYENNE DACNIS.—A male and two females above Arima on the Blanchisseuse Road, May 28.

Coereba flaveola luteola (Cabanis), CARIBBEAN BANANAQUIT.—Noted commonly throughout the island. A pair was found nest building at Carlsen on April 23.

Ateleodacnis bicolor bicolor (Vieillot), BICOLORED ATELEODACNIS.—Six seen in Caroni Swamp, May 24, where it is apparently quite common.

Compsothlypis pitiayumi elegans Todd, ELEGANT OLIVE-BACKED WARBLER.—Blanchisseuse Road, two on March 26. Carlsen Field, one, singing, May 21. Piarco-Ft. Read Road, one, singing, May 24.

Dendroica petechia aestiva (Gmelin), EASTERN YELLOW WARBLER.—Port of Spain, one on December 21. Seen occasionally all winter, Port of Spain and Carlsen.

Seiurus motacilla (Vieillot), LOUISIANA WATER-THRUSH.—This species was first observed at Carlsen Field on March 22. It has not been recorded from Trinidad before although it has been found in Colombia at about the same latitude. Another individual was observed at the same location on April 22 from a distance of only six feet. Four were seen the following day.

Seiurus noveboracensis noveboracensis (Gmelin), NORTHERN WATER-THRUSH.—Carlsen Field, one on April 6.

Geothlypis aequinoctialis aequinoctialis (Gmelin), EQUINOCTIAL MASKED YELLOWTHROAT.—A male seen at Carlsen Field April 19 and a female on April 23. One male noted in Caroni Swamp May 24.

Setophaga ruticilla (Linnaeus), AMERICAN REDSTART.—Carlsen Field, two, March 24.

Xanthornus decumanus insularis (Dalmas), CARIBBEAN CRESTED OROPENDOLA.—Widely distributed and especially common in the hilly forested country. The "Yellow-tail" was often observed from blimps as we flew over the forests.

Cacicus cela cela (Linnaeus), YELLOW-RUMPED CACIQUE.—Fifty birds and nests at Mayaro, October 25. Common throughout the island but more locally than the former species.

Psomocolax oryzivorus oryzivorus (Gmelin), RICE GRACKLE.—Arima, ten, March 26, Diego Martin Road, 15 on April 16. Cuare River, five on May 34. Blanchisseuse Road, common, May 28.

Molothrus bonariensis minimus Dalmas, LESSER SHINY COWBIRD.—Noted often in small numbers on the road from Carlsen Field to Port of Spain. Seen also at Carlsen, Caroni, and on the Diego Martin Road.

Holoquiscalus lugubris lugubris (Swainson), SWAINSON'S GRACKLE.—A common species along the roads and throughout the lowlands. About 100 could usually be seen on the drive into Port of Spain.

Icterus nigrogularis trinitatis Hartert, TRINIDAD ORIOLE.—Widely distributed. Seen December 21 in Port of Spain and often in the spring at Carlsen, Blue Basin, Ft. Read, Point-a-Pierre, and Macqueripe Bay.

Agelaius icterocephalus icterocephalus (Linnaeus), YELLOW-HEADED MARSH-BIRD.—Common in Caroni Swamp where 35 were seen May 24. Noted in smaller numbers at Carlsen and San Juan on many occasions.

Leistes militaris militaris (Linnaeus), CAYENNE RED-BREASTED BLACKBIRD.—First noted November 14 at Carlsen. Often seen here and in other wet country throughout the island, never in large numbers.

Tanagra violacea violacea (Linnaeus), VIOLACEOUS EUPHONIA.—Morne Coco Road, six on March 13. Blanchisseuse Road, five, May 28.

Tangara desmaresti (Vieillot), YELLOW-BREASTED TANAGER.—The natives call this little red-headed species the "Worthless." Blanchisseuse Road, six on March 26; fifteen on May 28. St. Benedict's Monastery, one, June 4.

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Tangara mexicana vieilloti (Sclater), VIEILLOT'S TURQUOISE TANAGER.—Blanchisseuse Road, ten on May 28. Carlsen Field, one, June 5.

Thraupis episcopus nesophilus Riley, TRINIDAD TANAGER.—A very common species everywhere. I found a nest with young at Carlsen Field on April 23.

Thraupis palmarum melanoptera (Sclater), AMAZONIAN PALM TANAGER.—Common and widely distributed. Seen in the greatest numbers at Tucker Valley, where groups of 25 or so could always be seen about the Naval Hospital grounds. Some are quite tame, and I have seen them on the dinner tables on the porch of the Queen's Park Hotel.

Ramphocelus carbo magnirostris Lafresnaye, TRINIDAD SILVER-BEAKED TANAGER.—First noted at Carlsen November 18 in the scrubby second growth. Noted often here and throughout the island. A group of 15 seen near Freeport in a bamboo thicket was the greatest number observed in one gathering.

Habia rubica rubra (Vieillot), TRINIDAD RED ANT TANAGER.—Two noted in the forest trees near the top of the Morne Bleu Road, March 26.

Tachyphonus rufus (Boddaert), GREATER WHITE-SHOULDERED TANAGER.—Known locally as the "Parson," and quite common in scrubby country. Usually seen in pairs. Seen often at Carlsen and on the Blanchisseuse and Cuare River roads.

Tachyphonus luctuosus luctuosus Lafresnaye and d'Orbigny, LESSER WHITE-SHOULDERED TANAGER.—One pair, seen along the southern slope of the Blanchisseuse Road on March 26, were the only birds observed of this rather rare species.

Saltator coerulescens brewsteri Bangs and Penard, BREWSTER'S SALTATOR.—Seen at Carlsen Field on three occasions, April 19 and 23, and June 5.

Paroaria gularis nigro-genis (Lafresnaye), BLACK-EARED CARDINAL.—G. D. Smooker and I found a pair nesting in a mangrove tree deep in Caroni Swamp on May 24. The nest contained two eggs well along in incubation. This is the second Trinidad nesting record; the previous nest was found by Smooker also in the swamp on September 21, 1931. Smooker considers the bird "very rare and very local." Hellmayr does not report the occurrence of this species in Trinidad and remarks that "trade skins are sometimes labeled 'Trinidad', no doubt erroneously." Two nesting records do seem to indicate, however, that this cardinal is established as a resident, and it is quite possible that the skins labeled "Trinidad" were actually taken there.

Sporophila intermedia Cabanis, GRAY SEED-EATER.—Seen often throughout the low, scrubby growth country but never in large groups.

Sporophila nigricollis nigricollis (Vieillot), YELLOW-BELLIED SEED-EATER.—Uncommon. Seen on Blanchisseuse Road on March 26 and May 28, and at Carlsen Field on May 21 and 26, and June 5. Four individuals on May 28 were the most seen on any one day.

Sporophila bouvronoides (Lesson), LESSON'S SEED-EATER.—This species is apparently subject to a local migration as it was not seen until May 21, at which time it was found in large numbers, singing. The places where it was observed at this time had been regularly visited before, and no birds in any numbers could have gone unnoticed. Smooker has found the nest in Trinidad, so the species is a resident. Observations were: Carlsen, 25 on May 21; Carlsen, May 22, "common"; Scotland Bay, five on May 23; Piarco-Ft. Read Road, two on May 24; Carlsen, two on May 26; Morne Bleu, four on May 28; and Carlsen, six on June 5.

Sporophila minuta minuta (Linnaeus), Minute Seed-eater.—A very common species. A flock of 50 or more was seen at Carlsen on March 22, and groups of 50 to 100 were often encountered thereafter about the island in open and scrubby country.

Oryzoborus crassirostris crassirostris (Gmelin), LARGE-BILLED RICE GROSBEAK.—Uncommon. Seen on three occasions: May 21 at Carlsen; May 24 at Cuare River Road, three; and May 28, Blanchisseuse Road, one.

Oryzoborus angolensis torridus (Scopoli), LESSER CHESTNUT-BACKED RICE GROSBEAK.—Another uncommon finch, noted at Carlsen on April 1 and May 22, one individual; four on May 26 and three on June 5; four on Cuare River Road, May 24; one near Ft. Read May 30.

Volatinia jacarina splendens (Vieillot), NORTHERN BLUE-BLACK GRASSQUIT.—Very common in the open country at Carlsen. A widely distributed species seen in large numbers throughout the island.

Philadelphia
Pennsylvania

BIRD NOTES FROM EL BAHIRA, TUNIS

BY F. H. BEZDEK

WHILE awaiting discharge of our cargo at the French colonial port of Tunis in the summer of 1944, I had a splendid opportunity to observe some of the bird life of an adjacent salt-water lagoon. At this season the area teemed with shore birds. With only an occasional saltbush patch along its flat, sandy shores, conditions were ideal for observations. This area circumscribes the bird notes recorded below.

The author wishes to acknowledge the assistance of Dr. J. P. Chapin of the American Museum of Natural History, during the preparation of this report.

In the late afternoon of August 13, 1944, our cargo steamer arrived at La Goulette, near the entrance of the canal leading to the harbor of Tunis. Damages resulting from the war made the canal impassible to larger ships, and we were forced to stop here. During the many trolley rides along the canal between the two cities I shall not forget El Bahira both for the abundance of shore birds and its stifling odor. Most striking was the conspicuous absence of bird life at this season on the Lac de Tunis side of the canal. A quick glance at the waters of El Bahira revealed why the avian hosts preferred this feeding ground.

El Bahira is a shallow man-made lagoon bordering the bay and city of Tunis. It is roughly kidney-shaped and approximately five by four miles. Construction of the canal and adjoining dikes created this small artificial 'lake' and cut it off from the Lac de Tunis except for a narrow channel at each end of the canal; in fact, these channels were so narrow in proportion to the overall volume of El Bahira that daily tides did not noticeably affect is depth. Fre-

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quent visits to the area confirmed these observations; the shoreline showed a negligible variation for at least a ten-day period.

The diked south side of the lagoon is rocky and, as might be expected, drops rapidly, but the remainder of the beach is monotonously flat. Birds were seldom disturbed, for only an occasional dwelling can be found within 200 yards of the lagoon and the odor emanating from it discouraged all but the most courageous visitors.

The depth of El Bahira was sufficient to accommodate small fishing craft; however, none of them were observed to approach within a few hundred yards of its margins. For some distance from shore, six to ten inches is the greatest depth; flamingoes waded with ease well over 300 yards from shore over all but the south portion.

Wind action seemed to be the dominant force affecting distribution of aquatic fauna and flora. When air currents were negligible a condition approaching stagnation resulted.

According to the authorities, raw sewage is poured into the lagoon at its eastern end. Its waters are a dark green, suggesting the presence of cyanophytic algae—a sharp contrast to the deep blue of the Las de Tunis. Floating colonies of dark green algae are conspicuous, but macroscopic littoral plant life is lacking.

Seldom will one find such an abundance of aquatic life; a small container dipped at random swarmed with minute midge larvae, crustaceans, and other larval metazoa. The shores are paved with gastropod and bivalve skeletons. Fish life is apparently plentiful, as indicated by the abundance of native fishing boats and the frequent hauls of fish. One can only guess the 'choice' flavor of fish from this open septic tank.

I was told that, during extremely hot summer weather, the lagoon often changes to a deep red color, apparently due to rapid reproduction of microscopic organisms. This phenomenon had already occurred in a small brackish pool nearby. It is accompanied by a dying off of myriads of other marine organisms. When this phenomenon has passed, with a return to a more normal ecological state, the two channels seem to provide travel lanes for a reinvasion of marine life.

I was amazed at the clock-like movement of shore birds and gulls between the east and west ends of El Bahira. The bird population could invariably be found feeding along the northeasterly shores in the early morning hours and at the opposite edge in the evening hours. Midday found them resting in scattered groups about the lagoon. These activities seemed to be correlated with the prevailing winds.

During our stay the weather was monotonously uniform: cloudless skies, a light westerly breeze from dawn to early afternoon, followed by a calm, then again a brisk wind from the opposite direction in the evenings. Birds were invariably found along the leeward shores.

SYSTEMATIC LIST OF BIRDS

DABCHICK, *Poliocephalus ruficollis.*—Ten birds fed along the diked shore. They were not frightened by the approach of the interurban trolley.

EARED GREBE, *Colymbus nigricollis.*—Plumage of four of these grebes indicated they were adults. This species is "suspected of breeding in the northern part of the Regency" (Whitaker, 1905).

COMMON HERON, *Ardea cinerea.*—Apparently these were immature birds; the crown was brownish-gray and nuchal plumes were not conspicuous. Gray supplanted the normal black dorsal areas of the adults.

FLAMINGO, *Phoenicopterus antiquorum.*—There were two separate flocks of at least 200 birds each on El Bahira. I saw only one young bird with grayish plumage.

RING PLOVER, *Charadrius hiaticula.*—These small plovers were nearly as abundant as *Tringa totanus.*

KENTISH PLOVER, *Charadrius alexandrinus.*—A few on the shores bordering El Ouina airport.

COMMON CURLEW, *Numenius arquata.*—There seemed to be but eight curlews on the lagoon. Though flushed from many points, always the same number took wing.

BLACK-TAILED GODWIT, *Limosa limosa.*—We observed six godwits in the company of the preceding species.

COMMON REDSHANK, *Tringa totanus.*—The most abundant shore bird; it was not unusual in flocks of 200 birds. They were all extremely wary.

MARSH SANDPIPER, *Tringa stagnatilis.*—Not more than a dozen individuals were seen at El Bahira.

COMMON SANDPIPER, *Actitis hypoleucos.*—Most often feeding singly or in twos. The short, rapid wing strokes and the habit of teetering are good field characters.

TURNSTONE, *Arenaria interpres.*—Two Turnstones were seen several times on the eastern borders near the city of La Goulette.

DUNLIN, *Erolia alpina.*—Three of these mingled with a flock of Redshanks along the eastern shores. The following day several more fed along the mudflats with several Ring Plover.

CURLEW SANDPIPER, *Erolia testacea.*—This species occurred in limited numbers with Ring Plover and Dunlins.

BLACK-WINGED STILT, *Himantopus himantopus.*—A single stilt appeared the first day, August 14, on the eastern shores. I never observed more than one bird, though the area was visited several times.

STONE CURLEW, *Burhinus oedicnemus.*—Three individuals were well camouflaged in saltbush along the canal. They exhibited a reluctance to leave the ground; their flight was short and labored, not unlike that of the Pheasant (*Phasianus colchicus*).

YELLOW-LEGGED GULL, *Larus argentatus cachinnans.*—Commonly seen in flocks of 100 or more. The mantle, intermediate between those of *Larus argentatus* and *Larus fuscus*, and the feet, not always yellowish, made identification of some birds difficult. For relationships, I refer the reader to Peters (1934).

NORTHERN BLACK-HEADED GULL, *Larus ridibundus.*—Six birds greeted us at the canal mouth at arrival, along with a single gull fitting the description of Audouin's

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Gull. A flock of well over 100 birds often fed over El Bahira, between August 16 and 20; all resembled in plumage adults of the second winter.

BLACK TERN, *Chlidonias nigra*.—This tern was the most prevalent representative of the Sterninae; it was not unusual to see 150 in flight at a time.

GULL-BILLED TERN, *Gelochelidon nilotica*.—At dusk on the third day I saw 50 birds take wing from a small sand spit.

LITTLE TERN, *Sterna albifrons*.—Only the Black Tern exceeded this species in numbers. These agile little birds often plummeted from considerable heights for food while their black relatives preferred to feed much closer to the surface.

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Naval Reserve Armory
Toledo, Ohio

RACES OF THE STRIATED MARSH WARBLER
(*Megalurus palustris* Horsfield)

H. G. DEIGNAN [1]

WITH the objective of ascertaining the number of recognizable races of *Megalurus palustris*, I have recently had occasion to bring together 85 specimens from Java, the Philippines, and the Asiatic mainland. For the loan of their extensive series of this species, I am indebted to the authorities of the American Museum of Natural History.

[1] Published by permission of the Secretary of the Smithsonian Institution.

It soon became apparent that, in this grass- and sedge-inhabiting warbler, with but one molt during the year, the plumage quickly becomes so worn and discolored as to render worthless for taxonomic study a large proportion of the specimens in museums. Indeed, I found suitable for my purpose only those examples that had but recently completed the postnuptial molt (or were nearing its completion). Since, throughout the range, this molt comes at the end of summer, I was able to employ all specimens collected between the months of September and February, inclusive, from whatever area, but this necessary eclecticism immediately reduced my usable material to only 35 skins.

Of the species as a whole, this much may be said: there is no external character by which females may be distinguished from males, and in either sex there is an extraordinary incidence of individual variation, appearing in just the characters that might be expected to have subspecific or sexual importance—the streaking on the upper parts and upper breast, and the length of wing or tail. While it is possible to recognize three geographical forms, this can be done only by a close study of the coloration of the upper parts when the birds are laid out in series; single examples of any population may be racially unidentifiable without reference to the label! The three subspecies here accepted are the following:

Megalurus palustris palustris Horsfield

Megalurus palustris HORSFIELD, Trans. Linn. Soc. London, 13: 159, May, 1821 (Java).

DIAGNOSIS: See below under *M. p. isabellinus*.

WING-LENGTH: 84–95 mm. (5 ♂ ♂).

RANGE: Java, Bali.

Megalurus palustris isabellinus Swainson

Megalurus isabellinus SWAINSON, Animals in Menageries, pt. 3 [Two Centenaries and a Quarter of Birds . . .]: 291, Dec. 31, 1837, or Jan. 1, 1838 (India; type locality here restricted to Assam).

Megalurus palustris andrewsi BANGS, Bull. Amer. Mus. Nat. Hist., 44: 592, Dec. 30, 1921 (Meng-ting, Yunnan, at the Burmese border).

DIAGNOSIS: "Similar to *M. palustris palustris* Horsford [*sic*] from Java and of about the same size, differing in the black striping of the upper parts being wider and more intensely black; the brown of upper parts deeper, brighter, more reddish brown, especially on the crown. The general color of upper parts in *M. palustris palustris*

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is clay-color to buck-thorn brown; general color of upper parts in the new form is ochraceous tawny, almost tawny on the crown."

The paragraph above is Bangs's description of his *andrewsi*, of which the type was collected on February 18; the essential differences between *palustris* and *isabellinus* could not be better stated.

WING-LENGTH: 97–113 mm. (4 ♂ ♂); 82–100 mm. (5 ♀ ♀).

RANGE: Parts of India, Burma, South China, Indochine, and Siam.

Swainson's name *isabellinus* has not been noticed in the standard lists of synonyms, and for this reason it was overlooked by Bangs; it seems, however, to be unquestionably applicable to the present form. In restricting the type locality to Assam, I have selected the Indian province in which the species is most numerous, and one which was already under British political domination as early as 1826.

Megalurus palustris forbesi Bangs

Megalurus palustris forbesi BANGS, Proc. New England Zool. Club, 7: 6, June 6, 1919 (Baguio, Benguet Subprovince, Luzón, Philippine Islands).

DIAGNOSIS: "Similar to *Megalurus palustris palustris* Horsf. of Java . . . ; colors paler and grayer throughout, less ochraceous-tawny; upper parts, including head, apart from the black streaking, tawny olive to Isabella color, with a grayish tinge . . ."

I quote here those parts of Bangs's description which are supported by my own much longer series. His type was taken on April 24 and therefore is probably somewhat worn and faded; the color characters listed, however, apply well enough to birds in fresh autumnal dress.

N.B. Speciments of both *palustris* and *isabellinus* become so gray with wear as to be inseparable by color from *forbesi!*

WING-LENGTH: 93–100 mm. (12 ♂ ♂); 79–97 mm. (9 ♀ ♀).

RANGE: Luzón, Catanduanes, Mindoro. (Worn birds from Samar, Marinduque, Masbate, and Mindanao presumably belong here as well.)

U. S. National Museum
Washington, D. C.

ON THE AFRICAN BARBETS

BY R. E. MOREAU

I have read Ripley's revision of the Barbets (Auk, 62: 542–563, 1945) with interest, especially that part concerned with the African barbets, which comprise so large a proportion of the whole family. I have no criticisms of the new generic arrangement, except to remark that *Buccanodon* and *Pogoniulus* (in the sense used by Sclater in the 'Systema Avium Aethiopicarum') seem to me well characterized natural groups that nothing is gained by confounding. Generic arrangements are, of course, as several authors have recently insisted, largely matters of convenience and of individual judgment. I do wish, however, to make a protest at the method of presenting the "list of accepted subspecies," which too often leaves the reader guessing whether Ripley has omitted a form through inadvertence or after the examination and rejection of material; and whether all those he has admitted (especially those bearing the asterisk that denotes "not examined") are after consideration of all the available data.

At the outset it seems obvious that Ripley is under a great debt to the 'Systema Avium Aethiopicarum': a large proportion of the geographical ranges he gives are in Sclater's words, and, with two exceptions, none of the forms which Sclater omits, specifically rejects, or casts doubt upon, appears in Ripley's list. (The fact that no acknowledgement is made to Sclater is no doubt a tribute to the fact that his 'Systema' is indispensable to any taxonomic study of African birds.)

What, then, are we to make of the fact that Ripley makes no mention of the following forms that Sclater admits and upon which, so far as I know, no subsequent author has cast doubt?

(a) *Lybius chaplini* Clarke
(b) *Lybius rubrifacies* (Reichenow)
(c) *Lybius vieilloti buchanani* (Hartert)
(d) *Buccanodon belcheri* Sclater

It may be useful to add that *B. belcheri* is now accepted as a (very distinct) subspecies of *B. olivaceum* (Shelley)—*see* Bull. B.O.C., 58: 84, 1938, and Ibis, (14) 4: 426, 1938; while *L. chaplini* may be a subspecies of *L. rubrifacies* [Ibis, 13 (2): 304–308, 1932].

Another form admitted by Sclater and not by Ripley, *Lybius zombae* (Shelley), has recently (Bull. B.O.C., 58: 104–106, 1938) been regarded as a subspecies of *L. torquatus* (Dumont), with *L. z. albigularis* Neumann as a synonym. It may be that Ripley cannot re-

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gard *L. zombae* as a subspecies (although it occupies an exclusive geographical area), because Salomonsen has regarded it as a mutant of *L. torquatus* (Proc. Eighth Internat. Orn. Congr. 1934: 190–198, 1938). If so, it is a point of view worth discussing.

Difficulties arise also about other barbets, which have been described since the publication of the 'Systema' and for the decisive rejection of which I find no published references, namely:–

(1) *Lybius bidentatus friedmanni* Bannerman
(2) *Trachyphonus margaritus berberensis* Bowen
(3) *Viridibucco leucomystax chyulu* van Someren
(4) *Pogoniulus pusillus lollesheid* van Someren (rejection in Bull. B.O.C., 58: 140, 1938, cancelled by acceptance in Bull. B.O.C., 63: 20, 1943).

Are these omitted from Ripley's list because they were forgotten or were they examined by him and rejected as synonyms? The first alternative must naturally be suspected in the case of (1) and (2) because the localities given by the authors for these new forms are outside the ranges given by Ripley for the species as a whole.

Since the 'Systema' was published, much taxonomic work has been done on the African barbets and conclusions on the validity of subspecies have been published especially by Chapin (Bull. Amer. Mus. Nat. Hist., 75: 488–534, 1939), Friedmann (U. S. Nat. Mus. Bull. 153: 436–466, 1930), Bannerman (embodied in 'Birds Trop. W. Afr.,' 3, 1939), Grant and Mackworth-Praed (Bull. B.O.C., 58: 82–84, 104–107, 116–117, 140–141, 1938 and 63: 19–20, 1943), Macdonald (Ann. Mag. Nat. Hist., (11) 2: 73–76, 1938[1] and Ibis (14) 3: 346–349, 1939), Grote (Orn. Monatsber., 46: 8–12, 1938) and Roberts (Ann. Transvaal Mus., 16: 109, 1935). Of all these authors, Chapin and Friedmann are the only ones included in the "literature cited" by Ripley, and inevitably the reader wonders whether due consideration has been given to the views of the others.

Yet Chapin has not been followed consistently. It is surprising to find the name *Lybius levaillantii,* which Chapin (*loc. cit.*) has noted as preoccupied, used by Ripley in preference to *Lybius minor* (Cuvier), which Chapin favors.

In such a case it is surely desirable that a reviewer of a group should cite the reference or other reasons that swayed him. In fact I would submit that every review of this nature would be improved and would be more readily acceptable if it gave evidence that all

[1] In which Ripley's inclusion of *Pogonorhynchus* and *Erythrobucco* in *Lybius* was anticipated and detailed arguments for that course were presented.

relevant sources had been examined, if all synonyms were cited, and if the grounds for each conclusion were stated, whether personal study of material or a specified publication. The size of such a review would be greater than one on the present model, but the increase in size would be thoroughly justified: and in cases where a sound general basis such as the 'Systema Avium Aethiopicarum' is available only departures from it need to be documented.

In a group review of this nature, which lists subspecies, it would also be useful to have some indication of the principles that have guided the author in a field of taxonomy that still causes so much controversy. It is, for example, noticeable that Ripley does not mention any of those subspecies which Grote described on size alone, *e.g., Lybius torquatus pumilio, Pogoniulus bilineatus rovumensis, Pogoniulus pusillus eupterus,* nor *P. p. lollesheid,* which is in the same category except that it has been accepted, not rejected, by Grant and Mackworth-Praed. One would like to know whether Ripley omits these forms because their measurements overlap with those of other forms (the grounds used by other authors, though it is not clear that adequate series of birds of the same sex have always been compared), or because they do not satisfy the 75% convention, or because some of these forms distinguished by Grote are part of a cline. If the last is true it would have been of interest to have the clinal tendencies indicated.

I take the opportunity of correcting some of the geographical ranges given by the author:—

(a) *Lybius leucocephalus lynesi* Grant and Mackworth Praed. The original description gave the range as "the Dodoma and Iringa Districts of Tanganyika Territory."

(b) *Lybius u. undatus* Rüppell. The range is given by Ripley as "Ethiopia" although four more subspecies are admitted, the ranges of which are all given (in Sclater's words) as including parts of Ethiopia. Sclater should be followed also for *L. u. undatus* and its range given as "Central Ethiopia from Addis Ababa north to Lake Tsana."

(c) *Buccanodon leucotis kilimense* (Shelley) and *B. leucotis leucogrammicum* Reichenow have their ranges given as "East Africa" and "Rufigi valley, Tanganyika" respectively. The range of *B. l. kilimense* should read "Mount Kenya to northern Tanganyika Territory (Usambara)" and that of *B. l. leucogrammicum* as "Rufiji valley and Uluguru, Tanganyika Territory" [Ibis, (12) 4: 82, 1928].

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(d) *Pogoniulus kandti* (Reichenow), which was described from Kivu, has been omitted altogether. Presumably it has been regarded as a synonym of *P. bilineatus jacksoni* (Sharpe), the course already taken by Grant and Mackworth-Praed (Bull. B.O.C. 58: 82, 1938), Chapin, Peters and Loveridge (Bull. Mus. Comp. Zoöl., 89: 241, 1942). But in that case it is not sufficient to give the range of *P. b. jacksoni* as "Mau Plateau at Nairobi, Mt. Elgon" as Ripley has done. The Kivu population of *P. b. jacksoni* appears, in fact, to be isolated from the Kenya population of the same form by about four hundred miles, in which *P. leucolaima nyansae* (Neumann) occurs. Ripley has treated as conspecific those forms regarded by Sclater, and by Chapin and others, as belonging to the two different species *P. bilineatus* and *P. leucolaima.* The question naturally arises whether before doing so he considered whether any difficulty is raised by the Kivu *P. b. jacksoni.* (This western population may extend from Lake Kivu across Urundi and Ruanda, for I have recently obtained *P. b. jacksoni* from Kasulu, which is about 180 miles SSE of Lake Kivu and the same distance SW of the SW corner of Lake Victoria.)

(e) The ranges given for *Lybius guifsobalito ugandae* Berger, *L. bidentatus aequatorialis* (Shelley), *Pogoniulus chrysoconus schubotzi* (Reichenow), *P. c. zedlitzi* (Neumann) and *Tricholaema hirsutum chapini* Bannerman are unsatisfactory in the light of the information given by Bowen ('Cat. Sudan Birds,' 1926–1931) and Woodman ('Sudan Notes and Records,' 21: 315–324, 1938).

So far as the African barbets are concerned the statement that "almost all the species are found in areas of high trees, either deep forest or old gardens," is misleading. The statement is correct for the genus *Gymnobucco* (all three species), for three species of the four usually placed in *Buccanodon* (but not for *anchietae*), for six of the eight species of *Pogoniulus* (but not for *pusillus* or *chrysoconus*), for two species included in *Lybius* (*hirsutus* and *bidentatus*), and for *Trachylaemus purpuratus* Verreaux—sixteen species in all. The statement does not apply to the four species comprising the (old) genus *Trachyphonus,* nor to the remaining thirteen species in *Lybius* (to which *L. rubrifacies* + *L. chaplini,* omitted by Ripley, may be added). There are, in fact, no less than twenty species of African barbets that do not depend upon "areas of high trees, either deep forest or gardens," a view that I base on a wide range of published references as well as personal experience. Instead they are birds of the drier, often semi-arid, areas of Africa, which fall into three main vegetation types:

(a) "Thornbush," dominated by *Acacia* and *Commiphora*, of which few trees exceed fifteen feet in height; (b) what has often been called "savanna"—grassland swept by fire every year, and scattered with what in the dry season look like dead apple trees (the *Obstgarten-steppe* of the Germans), with here and there clumps of semi-deciduous bush or of taller trees; (c) leguminous woodland, especially *Brachystegia–Isoberlinia* trees up to about sixty feet high, leafless for much of the year, and at all times throwing only light shade. Types (b) and (c) often include strips of more or less evergreen trees along the watercourses, and occasional great fig trees that are a prime attraction to some barbets. Type (c) and some of type (b) can be described as "well-wooded," but they are nothing like "deep forest."

A final point: specific and subspecific names of forms transferred from *Buccanodon* and *Tricholaema* to *Pogoniulus* and *Lybius* need to be given masculine endings in place of neuter.

Amani
Tanganyika Territory

SOUTHWARD INVASION IN GEORGIA

BY EUGENE P. ODUM AND THOMAS D. BURLEIGH

Plate 9

THE extensive changes in natural conditions resulting from the spread of civilization in North America have naturally affected bird populations. Many species have been forced to retreat, and their abundance as well as their ranges have been greatly decreased. On the other hand, other species have profited by white man's alterations and have not only increased in abundance but in many cases have also extended their ranges. Because of the large amount of publicity given to vanishing species, bird students often forget the possible compensation provided by the advancing species. True, these latter are mostly small birds which do not have the glamour or popular appeal of such birds as Whooping Cranes and Ivory-billed Woodpeckers, but from the biological and economic standpoint they are equally worthy of study. When a species increases and invades new territory, it not only introduces a new and perhaps important factor into the biotic community, but speciation may also be affected since a new subspecies or species may eventually evolve in the new environment. In other words, just as artificial selection speeds up the evolution of domestic plants and animals, enabling man to learn something of the causative factors involved, so artificial changes in the environment speed up changes in natural populations, enabling

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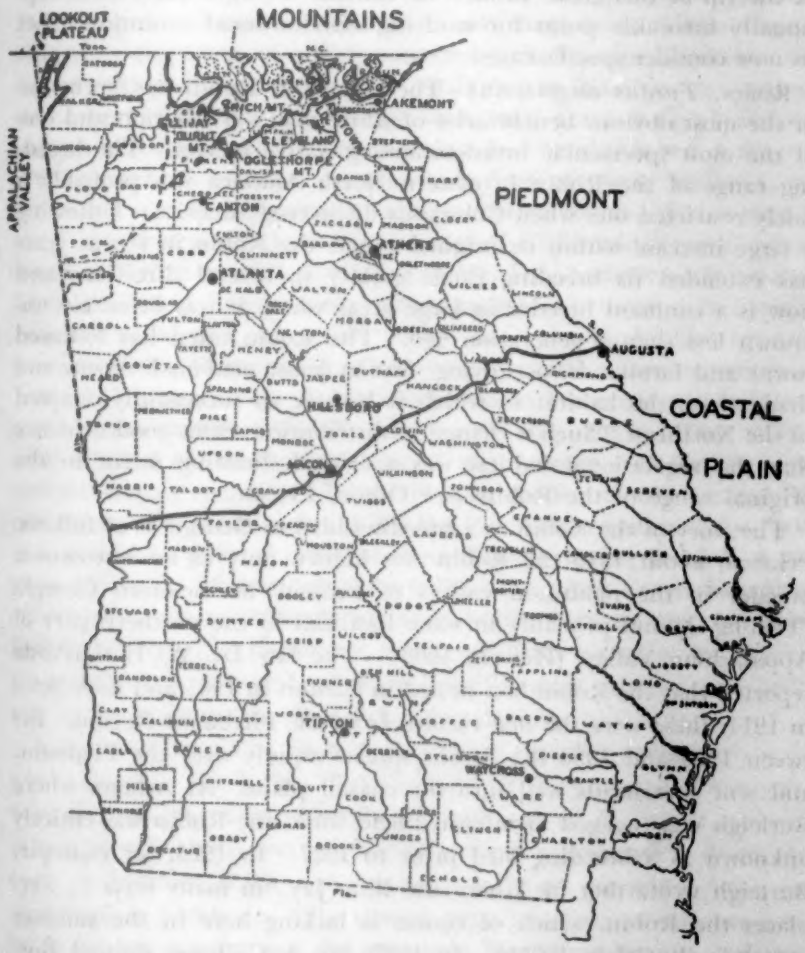
us to learn something of the forces at work in this particular aspect of evolution.

It is the purpose of this paper to discuss three recent examples of breeding range extension in Georgia, to analyze possible factors involved, and to list other species that may bear watching in the future. Some of the story of these invasions has been told in The Oriole, the journal of the Georgia Ornithological Society (see Literature Cited). Text-figure 1 is a sketch map of the state, showing the physiographic



TEXT-FIGURE 1.—Map of Georgia showing physiographic regions and localities mentioned in this paper. In the Mountain Region the stippled areas are the mountain valleys or plateaus (elevation 1600–2000 ft.) and the non-stippled areas represent the peaks and ridges which rise up to 4768 ft. elevation (Brasstown Bald).

regions and the specific localities referred to in the subsequent discussion. Georgia lies at the end of the main Appalachian chain which is a narrow but more or less continuous highway that 'funnels,' as it were, many northern species into the heart of the Southland. Some typically northern species do not breed all the way to the end of the mountain chain; a great many species occur to, or nearly to, the end but no farther; still others have spread out from the mountain ridges onto the hills and plains beyond. Because of its position at the tip of this great 'funnel' or 'salient,' Georgia offers an exceptionally favorable point for studying distributional evolution. Let us now consider specific cases.

ROBIN, *Turdus migratorius*.—The American Robin has been one of the most obvious beneficiaries of white man's civilization and one of the most spectacular invaders among native species. The breeding range of the Robin in eastern North America was probably a fairly restricted one when Columbus discovered America. Following a large increase within its original range, the Robin in recent years has extended its breeding range greatly in several directions and now is a common breeder in large areas where it was definitely unknown less than a generation ago. The Robin often has followed towns and farmlands, occupying, first at least, man-made lawns and shade trees, the habitat to which it became so successfully adapted in the Northeast. Such a change in distribution seems good evidence that the vegetational habitat was a critical, limiting factor in the original range of the Robin (*see* Odum, 1945c).

The story of the Robin as a breeding bird in Georgia is as follows. Prior to about 1910 the Robin was known only as an uncommon breeder in the mountain valleys of extreme northeastern Georgia (Text-fig. 1) and probably in some localities in the northern part of Appalachian Valley (Howell, 1909). The late Dr. W. H. LaPrade reported that the Robin first nested in Canton in 1905 and in Atlanta in 1914; these were the first records from the Piedmont Region. Between 1920 and 1930 the Robin spread rapidly over the Piedmont and sent spearheads well into the coastal plain. At Athens, where Burleigh was engaged in intensive field work, the Robin was entirely unknown as a breeding bird prior to 1927. In 1925, for example, Burleigh wrote that in Athens the Blue Jay "in many ways . . . replaces the Robin, which of course is lacking here in the summer months" (Burleigh, 1925b). In 1927, Mr. J. C. Jester showed Burleigh the first nest of the Robin to be found in Athens; it was in a shade tree in a residential section of town and contained eggs on

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May 7. During the next few years the species nested in various parts of town and on the campus of the University of Georgia, gradually increasing in numbers. At present it is almost as characteristic a bird in residential areas as it is in a typical New England town. Other North Georgia towns and cities were similarly invaded. In Augusta, 90 miles southeast of Athens and nearly 150 miles from the mountains, the Robin first nested in 1929 (Murphey, 1937). In Macon, the first definite breeding evidence was obtained in 1932, but the Robin probably nested there two or three years previously (J. Fred Denton, personal communication). From these dates, it would seem that the occupation of widely scattered points in the Piedmont occurred within a very short time. As far as we know at the present time, the Robin nests in all large towns and cities in the 18,000 or so square miles of the Piedmont region, but (and this is a point we shall come back to later) apparently it does not occur in the rural areas and is only beginning to occupy smaller towns. For example, the Robin first nested in the little town of Hillsboro, Jasper County, north of Macon, in 1945, according to Mr. J. S. Anderson. It has not been detected in Jones County, which has no large towns even though adjacent to Macon, where the Robin has been established for ten years or more (Raymond J. Fleetwood, personal communication).

In 1937, a nest of the Robin was found in Waycross, which is but a few miles north of the Florida line (Flagg, 1937). This is the southernmost record that we have at the moment. There is also a definite nesting record at Tifton. Whether the Robin will successfully occupy the Coastal Plain as it has the Piedmont remains to be seen.

It should be pointed out that these Georgia-nesting Robins apparently belong to the southern subspecies, *achrusterus* (as indicated by specimens taken at Athens); in other words, they are not northern Robins which failed to migrate north, but birds spreading southward from the southern periphery of the specific range, which before 1910 was in and around the tip of the Appalachian backbone.

SONG SPARROW.—The Song Sparrow has invaded southward more gradually than the Robin, but the new territory occupied has been extensive. The southern border of the range of *Melospiza melodia* is two-pronged, with one population (*atlantica*) extending down the coast to Beaufort, N. C., and another population extending down the Appalachian backbone. The coastal population apparently has been static for many years, but the mountain birds have been actively advancing. Prior to 1885 the Song Sparrow did not nest anywhere in western North Carolina; at least William Brewster and Elliott Coues—

eminent field men—failed to find them (Pearson, Brimley, Brimley, 1919). Between 1885 and 1900, Song Sparrows began nesting in the mountain valleys of northwestern North Carolina and gradually spread southwestward, first reaching Murphy in Cherokee County, at the extreme tip of the state, about 1910, according to records kept by C. S. Brimley. Thus, the species pushed southwestward about 175 miles in less than 25 years. Song Sparrows did not nest in Georgia when Arthur H. Howell worked the extreme northeastern part in the summer of 1908; at least he did not record a single individual (Howell, 1909). In 1922, Burleigh (1925a) found the Song Sparrow breeding in Rabun, Towns, Union, and Fannin counties, where the mountain valleys are directly connected with those of North Carolina. The species subsequently increased noticeably in numbers (Burleigh, 1927), and at present even the most casual observer could scarcely miss seeing or hearing it in any of the three mountain valleys. As indicated in Text-figure 1, these mountain valleys (in reality they are 'plateaus,' having an elevation of 1,600 to 2,000 feet) are separated from the Piedmont region of the state by a rather formidable barrier, the Blue Ridge. It might be expected that this barrier would halt or at least slow down the invasion, since birds would have to find their way through gaps or over high, forested ridges in order to reach suitable habitat to the south. During the summer of 1945 we made a special effort to find out if the species had actually reached the Piedmont. Driving north from Atlanta, we first encountered Song Sparrows at Ellijay, Gilmer County, and collected a juvenile not long out of the nest. Farther east the species was singing and evidently breeding at Cleveland, White County. Finally, Mr. Glenn Bell has reported a nest from Lakemont. A line drawn connecting these points approximately represents the present 'front.' All three of these localities are south of the Blue Ridge (Text-fig. 1) and have altitudes of less than 1,600 feet. Therefore, the Song Sparrow has actually gotten out of the mountain valleys and become established on the northern edge of the Piedmont. Since there are no further physiographic or habitat barriers to the southward, it will be interesting to watch the species closely during the next few years. In the meantime, the Song Sparrow has already begun to invade the North Carolina Piedmont, probably moving eastward from the mountains. Since 1941, nests have been reported at Statesville, Winston-Salem, and Greensboro (information furnished by C. S. Brimley), the last locality a long way from the mountains. It would seem logical to predict that the Song Sparrow will soon be nesting in Atlanta and Athens, but only time will tell.

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An interesting taxonomic problem is posed by the invasion, since two distinct subspecies may be involved. Birds which have entered Georgia are apparently *M. m. euphonia*. Those invading the North Carolina Piedmont are probably of the same variety but may be *M. m. melodia* (Pearson, Brimley, Brimley, 1942). The unstable situation should provide an unusual opportunity for studying the effects of changing populations and new environments on a notably plastic species.

CHESTNUT-SIDED WARBLER.—*Dendroica pensylvanica* is another species which apparently did not breed anywhere in Georgia prior to 1910 but which has since made a rather spectacular entry into the state. Howell in 1908 did not record a single individual on any of the high peaks which he visited, namely, Oglethorpe Mountain, Rich Mountain, and Brasstown Bald (*see* Text-fig. 1). In 1925, Burleigh (1927) found the species to be fairly common on Brasstown Bald, mostly above 4,000 feet, and found the first nests to be reported in the state. Since that time the Chestnut-sided Warbler has moved down to lower elevations and has apparently followed the ridges southwestward, since in June, 1945, we found it common about the tops of Burnt and Oglethorpe mountains[1] (3,000 to 3,300 feet) in Pickens County where the Blue Ridge comes to a rather abrupt end (Text-fig. 1). On June 23, Odum made a strip census along the ridge connecting Burnt and Oglethorpe mountains and found the Chestnut-sided Warbler by far the commonest and most conspicuous bird in the scrubby thickets growing under blighted chestnuts. On the slopes it occurred down to 2,600 feet (Odum, 1945a, b). It hardly seems possible that Howell could have missed so conspicuous a bird when he visited this same area in 1908, had it been present; therefore, it seems clear that this is new territory for the species. Unfortunately, we have no way of knowing just when it appeared here, since ornithological observations in this part of the state have been few during the intervening years. Since the Chestnut-sided has followed the high ridges rather than the valleys, it would seem logical to conclude that the invasion will stop at its present point, the end of the high ridges—but again time will tell!

ANALYSIS OF THE INVASIONS.—While the range boundaries of most species usually fluctuate somewhat from year to year as a result of minor invasions and retreats, rapid and extensive changes are not expected unless there are drastic changes either in the species itself

[1] Mt. Oglethorpe, formerly known as "Grassy Mt." (on old topographic sheets), is the southernmost peak exceeding 3,000 ft. in elevation in eastern North America, and is the southern terminus of the famous Maine to Georgia Appalachian Trail.

or in the environmental limiting factors. As far as we can determine, the complicated machinery of mutations and natural selections, by which species are believed to change, proceeds very slowly indeed; many years are required to produce even small changes in basic morphology and physiology. Therefore, our attention is focused on the rôle played by changed environments. Furthermore, since climates have not changed recently, a change in habitat or biotic community would seem to be the most likely cause of the rapid-type invasions such as are described in this paper. (The activities of man may be causing climates to become slightly warmer and drier; this might be a factor in the northward spread of southern species but certainly would not aid the southward invasion of northern species as described here.)

There would seem to be three prerequisites for such invasions, as follows: First, the prospective invader must be able to tolerate the climate outside its original range; that is, climate must not be the critical limiting factor in the direction of invasion. Secondly, suitable habitat, previously unavailable or present in too small a quantity in the prospective new territory (hence a limiting factor), must be increased to a large enough volume for the species to gain and maintain a foothold. Finally, sufficient population pressure within the original range would seem to be necessary to encourage birds to occupy the new territory. The first two conditions would seem to be obvious, and require no elaboration. The third condition is partly assumption. Life-history studies have shown that individual birds are remarkably 'conservative' or 'traditional,' even though possessed of great powers of movement, and tend to return to, or remain within, the same area year after year. After the first breeding season, both the homing urge and the homing ability are generally good. Birds of the year may be more adventurous and seek new territory, but even the young of some species may return in a large degree to their birthplace as recently reported in the case of the Robin (Farner, 1945). If the population is relatively stable, few individuals would have an occasion to seek new territory far from traditional haunts. If, on the other hand, the population is rapidly increasing, individuals might be encouraged to spread if they can.

The Song Sparrow and Chestnut-sided Warbler invasions seem to have been fairly slow and gradual so far, with the breeding birds following natural physiographic features such as mountain ridges and valleys. In the case of the Song Sparrow, the invasion of the Piedmont apparently has begun only after the mountain valleys were

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OGLETHORPE MOUNTAIN, GEORGIA. SLOPE NEAR THE SUMMIT SHOWING DENSE THICKETS WHICH HAVE REPLACED THE CHESTNUTS KILLED BY THE BLIGHT (IN BACKGROUND). IN THE FOREGROUND NOTE THE CHESTNUT SPROUTS PERIODICALLY KILLED BACK TO PRODUCE A SHRUB LIFE-FORM.

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thoroughly occupied. The Robin invasion has been somewhat different, more analogous to an 'airborne' invasion of modern warfare; that is, rather widely scattered points (towns) were occupied within a few years, leaving intervening areas (rural areas) so far unoccupied. All three invading species have one very important thing in common: all nest in early seral or developmental stages of vegetation (or the artificial equivalents) of types that had been increased tremendously prior to the invasion. As pointed out elsewhere (Odum, 1945c), man reduces the sharp differences between natural areas both by establishing a rather uniform 'forest-edge' habitat in the vicinity of his dwelling and by generally increasing the quantity of developmental vegetation at the expense of the mature or climax vegetation. Species which are adapted to early developmental communities and which have wide climatic tolerance are thus encouraged to spread. As a rule there is some delay between the time wholesale habitat changes occur and that when a species begins to move into entirely new territory. In the case of the Robin, for example, lawns and shade trees were widely established in northern Georgia some years before the Robin actually began to occupy them. This would seem to be explained by assuming that the new habitat within the original range was occupied first and that only after a series of highly successful breeding seasons had produced a large surplus of birds did the rapid occupation of new territory begin. The slaughter of Robins on their wintering grounds in past years may also have been a factor in delaying the invasion. In other words, it seems clear that wholesale changes in habitat are directly responsible for each of the invasions described here, even though habitat selection and habits of the three species differ in a number of ways.

Let us examine the Robin's special case. Before colonization of eastern North America by the white man, the best Robin habitats were probably natural meadows, grassy forest edges, and open forests with scant undergrowth. Such situations were certainly most abundant under original conditions in northern and middle eastern North America. Large areas of tall grass prairie to the west and the oak and pine forests to the south would seem to have offered very little Robin habitat—at least the Robin had not been able to establish itself in these areas. During the last hundred years, man has provided huge areas of suitable habitat both in the original range and in adjacent areas. The invasion into Georgia is especially interesting since it shows rather clearly that the Robin is indeed somewhat specialized in regard to habitat selection. As mentioned before, the

Robin has so far occupied only the cities and towns and apparently the larger ones first. Here the bird finds large areas of lawns and shade trees very much to its liking. Rural areas in this part of the country consist of cotton and corn land, bunchy tall broomsedge grass, and open pine and oak forests with a large amount of undergrowth; none of these habitats seems to be liked by the Robin. Farm homes and those in small villages generally do not have lawns or very much shrubbery. As the Robin becomes firmly established in the cities, it might gradually work out into the submarginal or isolated areas available in rural areas. Also, rural areas in Georgia are undergoing change. Much cotton and corn land is being planted with cover crops and grass. As the erosion and tenant farmer evils are checked, more interest will be taken in lawns and plantings around dwellings, benefiting both man and the Robin. It will be interesting to watch these changes. The really remarkable feature of the Robin invasion is that the birds were able to jump over unsuitable rural areas and occupy widely scattered cities within such a short space of time. The only way we can explain it is to assume that there must have been a tremendous build-up of population to the north, thus providing thousands of birds which were forced, or at least encouraged, to seek new territories. The invasion seems to have been temporarily stopped or slowed down at the edge of the Coastal Plain. Perhaps another build-up in population will precede the next push, or perhaps further southward extension will be gradual. Also, conditions are rather different on the Coastal Plain. Towns are fewer and smaller; large areas of unbroken pine flatwoods and swamps in the southern part of the Coastal Plain would not seem to offer congenial breeding habitat for the Robin. Also, it must be remembered that climate might replace habitat as the critical limiting factor at any point, especially at the transition between natural regions. Nevertheless, the nesting records at Waycross and Tifton show that the species is at least attempting occupation of the Coastal Plain. Perhaps some day, Robins will be nesting in Miami, Florida!

Perhaps even more than the Robin, the Song Sparrow is a bird of wide climatic tolerance but with, by comparison, relatively restricted habitat requirements. Nesting Song Sparrows favor bushy growths that commonly occur as early stages in many seres, or artificial equivalents planted and maintained by man in the vicinity of his dwellings. The species is especially partial to bushy vegetation in the vicinity of water. The Song Sparrow had worked down the coast along a narrow strip of natural vegetation of a scrubby life form on the dunes

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and salt marshes, nesting largely within the sound of the surf. With the breaking up of the continuous forests of the mountain region and the establishment of clearings in the stream valleys, favorable conditions for the Song Sparrow on a large scale were created, and the bird has not failed to take advantage of them. Small-scale farming practices in all of the upper South are very favorable to the Song Sparrow, since both stream borders and fence rows bordering on cultivated fields or pastures are almost always left with a good strip of weeds and bushy vegetation. Once the Song Sparrow was well started down the Appalachian backbone, it would be expected that the bird would eventually occupy all of the mountain region. This phase of the invasion has been completed during the past few years. The question then is: will the Song Sparrows continue on into the Piedmont where the climate and the plant and animal communities are rather different, but where plenty of stream-side and upland habitat is available? It is too early yet to venture a definite conclusion, but the Song Sparrow has definitely begun the invasion of the Piedmont both eastward in North Carolina and southward in Georgia.

The Chestnut-sided Warbler is far less widely distributed than either the Robin or the Song Sparrow, being largely restricted to the ecotone between the Eastern Deciduous Forest and the North Coniferous Forest (or part of the eastern half of the Transition Zone of Merriam). However, the fact that the bird has invaded new areas indicates that factors other than climate were involved in restricting the original range boundaries. Again, as in the cases of the Robin and the Song Sparrow, wholesale changes in habitat would seem to be the immediate cause of the southward invasion.

Proceeding southward along the Appalachian Mountains from Virginia and North Carolina to Georgia, the mountain peaks and ridges become lower and more scattered. Under original conditions, the Chestnut-sided Warbler habitat was undoubtedly scarce and isolated on the southern end of the backbone, since slopes were generally covered with a heavy forest. Isolated natural 'balds' of scrub vegetation, occasional dry ridges, and perhaps some slopes burned over by fires started by lightning and Indians would provide the only suitable habitat. At least, the bird apparently was not able to gain a foothold in this region, where climate may also have been approaching a critical point. The original situation has been rather radically changed, not only by lumbering and fire, but more especially by the chestnut blight which has leveled every large chestnut tree in these vast forests, where the chestnut once composed a good

50 per cent of the dominants over large areas. Plate 9, a photograph taken near the summit of Mount Oglethorpe, shows the gaunt, dead chestnuts, many still standing, and the dense thickets that have replaced the forest. This picture is typical and could be duplicated over thousands of square miles of high ridge country throughout the southern Appalachians. The chestnut is down but not out; as soon as a tree is dead, copious sprouts appear at the base and grow quickly upward, only to be killed before reaching an appreciable height and to be quickly followed by new sprouts. Even with the blight, the chestnut is able to maintain itself as a partial ecological dominant, since the sprouts are often so vigorous that they shade out competitors (*see* Plate 9). Thus the blight has produced a sort of semi-permanent disturbance climax (or 'disclimax') which Brooks (1940) has called the "Chestnut Sprout Association." This shrubby vegetation is entirely different from the original forest and provides ideal habitat for thicket-loving, 'early seral' birds such as Towhees, Brown Thrashers, Catbirds, Indigo Buntings, Yellow-breasted Chats, and the Chestnut-sided Warbler, all of which were very much in evidence at the site shown in the photograph. It would be hard to estimate how many acres of territory formerly unsuited to the Chestnut-sided Warbler (and the other species mentioned) have been made suitable, but figures would no doubt run into millions. Presumably, as in the case of the Robin, the warbler first increased within its original range; then, when population pressure developed, it spread southward along formerly unoccupied ridges following the broad highways provided by the wholesale vegetative changes. It might be noted in passing that more local and less spectacular invasions of other species may also have resulted. For example, the presence of Chats on the very tops of Georgia's highest peaks probably represents an upward invasion favored by the production of large bands of suitable habitat extending from base to summit.

The chestnut blight first began to make itself felt in Georgia about 1900. By 1920, most of the large trees were dead and the undergrowth and sprouts increased accordingly. At about this time the Chestnut-sided Warbler first appeared in northeastern Georgia as a breeding bird. In general, the blight has been considered one of nature's great tragedies, since some very fine timber was completely wiped out. For the Chestnut-sided Warbler (and other species), however, it was a great windfall. Another interesting feature of this change is that it was the result of a biotic factor not directly caused by man (in fact, man did everything possible to prevent the

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spread of blight). Even the short lifetime of an individual may not be too short to observe significant natural changes of evolutionary importance. One wonders how many times in ages past a similar natural catastrophe has influenced the affairs of species by aiding some to spread and by forcing others to retire, perhaps to the point of extinction.

OTHER INVADERS.—The three species discussed are by no means the only ones which have shown definite tendencies towards southward and eastward invasion in the southeast. Unfortunately, knowledge of past distribution is so poor in this region that only the most spectacular changes in distribution can be detected. The phenomenon of invasion serves to emphasize the value of careful local studies and local lists which give data on abundance, status, and habitat selection of the common as well as the rare species. If we were to follow accurately distributional changes in the future we must have a more accurate knowledge of present distribution. As far as Georgia is concerned, the following three species, especially, may bear watching in the near future.

HOUSE WREN.—The House Wren has extended its range southward very recently, having made a rather rapid invasion of the North Carolina Piedmont beginning about 1922 (Pearson, 1934). Previously, the bird was entirely unknown as a breeding bird in this state. The invasion was similar to that of the Robin in Georgia in that widely scattered towns were occupied in a short space of about ten years (*see* Pearson, Brimley, Brimley, 1942). We have been on the lookout for the House Wren in Georgia especially during the past breeding season (1945), but have found no sign of it. If the House Wren does invade Georgia it will be interesting to see if it enters via the mountains, where Bewick's Wren breeds, or the Piedmont, where Bewick's Wren does not nest.

PRAIRIE HORNED LARK.—The Prairie Horned Lark has been gradually moving eastward and southward, starting from the original home in the natural grasslands and occupying the very extensive man-made grasslands in the Eastern Deciduous Forest Region. Like the Robin and Song Sparrow, the Horned Lark is a bird of very wide climatic tolerance, breeding from the desert to the tundra. With removal of the forest barrier (another example where habitat was a limiting factor in the original range) it has spread into new areas. In the northeast, the lark has already reached the coast. In the southeast it has been detected breeding in North Carolina and recently in northwestern Alabama (McCormack, 1943). Consequently, it may soon be added to the list of the breeding birds of Georgia.

MOUNTAIN SOLITARY VIREO.—*Vireo solitarius alticola* is characteristic of, and generally restricted to, the Appalachian backbone, but some time in the unrecorded past the species has spread across the entire Piedmont Region of North Carolina at least as far east as Raleigh. In Georgia the Solitary Vireo is still pretty well restricted to the mountains but recently we have observed it in summer on the upper edge of the Piedmont at very low elevations. The Piedmont birds (both in North Carolina and in Georgia) seem invariably to choose fairly mature but hot and dry pine woods for nesting, a rather striking contrast to the cool, usually deciduous, ravines occupied in the mountains. As has been pointed out by Brooks (1942) habitat selection of some species is rather radically different at the periphery as compared with the bulk of the range. The 'marginal adaptation' to a new habitat may be an important factor in the invasion of some species. Invasion as result of a change in habitat selection is rather different from the invasions which we have been discussing where a species simply occupies newly created habitat without a basic change in habitat selections. Since the former implies some change in the bird itself, we may expect invasion of this sort to progress very slowly. The Solitary Vireo may be a good species to watch in the future even though very rapid changes probably are not to be expected.

SUMMARY.—The Robin, Song Sparrow, and Chestnut-sided Warbler have extended their breeding ranges southward during the past 35 or 40 years. Prior to 1910, the Robin nested only in the extreme northern part of Georgia and the other two species were entirely absent as breeding birds. At present the Robin has occupied all of the Piedmont Region and has nested in several places in the Coastal Plain. The Song Sparrow is well established throughout the Mountain Region and has very recently begun invading the Piedmont both in Georgia and in North Carolina. The Chestnut-sided Warbler now nests abundantly along the high ridges of the Mountain Region of Georgia as far south as Oglethorpe Mountain, Pickens County, where the Blue Ridge comes to an abrupt end. Since all three species breed in early seral or developmental stages of vegetation of types greatly increased by civilization, it seems likely that wholesale vegetative changes are directly responsible for these and other spectacular, rapid invasions. The Robin has occupied widely scattered cities and towns but not, as yet, the intervening rural areas where suitable habitat is lacking under present agricultural practices. The Song Sparrow invasion resembles a pincers movement since, in addition to the mountain valley invaders, a population (*atlantica*) has followed a narrow strip of natural vegetation of shrubby life form on

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the coast. The latter population, however, has shown no recent evidence of expansion. The Chestnut-sided Warbler invasion seems clearly correlated with the chestnut blight which has rendered thousands of acres of high ridge country into a sort of 'chestnut sprout disclimax,' a habitat well suited to nesting needs of this and other species. As far as Georgia is concerned, the House Wren, the Prairie Horned Lark and the Mountain Solitary Vireo are additional species showing invasion tendencies that may bear watching in the future.

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The University of Georgia
Athens, Georgia
Fish and Wildlife Service
Atlanta, Georgia

A COÖPERATIVE STUDY OF THE WHITE-THROATED SPARROW

BY RICHARD B. FISCHER AND GEOFFREY GILL

INTRODUCTION

IN the fall of 1943, the Eastern Bird Banding Association undertook a study of the White-throated Sparrow, *Zonotrichia albicollis* (Gmel.), based on the data of its members and later from other banders who wished to coöperate. The October and November, 1943, issues of EBBA News, the Association's monthly news-letter, outlined some of the results of this investigation, but the large volume of data submitted indicated that a more detailed study and report were desirable.

Reports were received on 43,000 birds banded by 52 persons. Invaluable assistance was received also from F. C. Lincoln and Chandler S. Robbins of the U. S. Fish and Wildlife Service. To them and to all who sent in their records and comments, the Eastern Bird Banding Association extends its thanks. The authors are indebted to J. T. Nichols for his reviewing of the manuscript, and to Dr. Harold B. Wood, President of the Association, who also read the paper and assisted in tabulating the data. For the critical reading and suggestions by Prof. O. A. Stevens, Secretary of the Inland Bird Banding Association, the authors wish to express their deep appreciation.

THE NUMBERS BANDED

Among the Passeres, more Juncos, *Junco h. hyemalis* (Linn.), are banded each year than any other species; the White-throated Sparrow is a close second. Before 1924, 3,975 White-throated Sparrows had been banded. From 1924 through June, 1943, the number amounted to 223,369. The annual total of these birds banded varies between 8,000 and 20,000. The species is an abundant migrant, especially along the Atlantic Coast and the Mississippi River flyways.

The White-throated Sparrow is not a shy bird during its wintering and migratory seasons and is readily taken in a variety of traps baited with small grains, white bread, water, etc. Wintering birds often develop the 'trap habit' to an extent that they become an annoyance. Dr. C. Brooke Worth of Swarthmore, Pennsylvania, tells of removing one of these persistent repeaters from a trap. Standing with his legs straddling the trap, he threw the bird as high in the air as he could. The bird described a simple arc back to earth and reëntered the trap between his legs. B. S. Bowdish of Demarest, New Jersey, records a White-throated Sparrow repeating 271 times in a single winter.

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TABLE 1

CONTRIBUTING BANDERS AND GENERAL DATA

Bander	*Location (north to south)*	*Years of banding*	*Total banded*	*Returns*	*Recoveries*
Will O. Astle	New Brunswick, Can.	5 summers	189	4	0
Prof. Ralph DeLury	Ottawa, Canada	22	800	1	1
Prof. O. A. Stevens	Fargo, N. D.	18	3096	0	3
G. Hapgood Parks	Millbridge, Me.	6 summers	26	3	0
Mrs. J. F. Anthony	Bar Harbor, Me.	14	200	0	0
Mrs. C. E. Peterson	Madison, Minn.	10	636	0	1
Howard H. Krug	Chesley, Canada	10½	51	0	0
Clarence A. Searle	Wisconsin Rapids, Wis.	3	72	0	0
Mrs. M. T. Maxon	Milton, Wis.	7	467	0	0
C. C. Ludwig	Lansing, Mich.	17	2573	0	1
Malcolm Lerch	Penn Yan, N. Y.	6	188	0	0
Verdi Burtch	Branchport, N. Y.	21	802	0	1
Samuel D. Robbins	Belmont, Mass.	7	118	0	0
H. E. McArthur	Waukegan, Ill.	13	2270	0	0
Daniel Smiley, Jr.	Mohonk Lake, N. Y.	3 years and 3 springs	770	0	3
G. Hapgood Parks	Hartford, Conn.	6	208	0	0
Karl E. Bartel	Blue Island, Ill.	10	3627	0	4
F. C. Labahn, Jr.	Blue Island, Ill.	11	3514	0	2
Raymond T. Fuller	Winterton, N. Y.	4	137	0	0
P. H. Oppmann	Lakewood, Ohio	6½	238	0	0
Vernon C. Rossman	Kankakee, Ill.	11	3036	1	2
Rev. J. H. Baeckle	Collegeville. Ind.	2½	814	0	0
George Dock, Jr.	Scarsdale, N. Y.	4½	383	2	0
Carl A. A. Pedersen	Woodcliff Lake, N. J.	10	141	0	0
Mrs. Marie Dumont	Pequannock, N. J.	11½	1218	1	0
Patrick K. Garland	Demarest, N. J.	6 years and 3 half yrs.	953	4	2
Selah Lester	East Hampton, N. Y.	3	6	0	0
LeRoy Wilcox	Speonk, N. Y.	16	447	7	0
Geoffrey Gill	Huntington, N. Y.	17½	300	15	0
Jesse V. Miller	Manhasset, N. Y.	4	343	1	1
Will O. Astle	Flushing, N. Y.	5½	201	0	0
Richard B. Fischer	Flushing, N. Y.	4	509	3	0
R. & G. Ralston	Flushing, N. Y.	6	333	2	1
Howard Mahnken	Brooklyn, N. Y.	3	65	0	0
Dr. Harold B. Wood	Harrisburg, Pa.	15	48	0	0
Ralph E. Wetzel	Boiling Springs, Pa.	2	3	1	0
Raymond J. Middleton	Norristown, Pa.	22½	4435	4	9
William Pepper, Jr.	Wyncote, Pa.	11½	803	14	2
Mrs. C. R. vanHeeswyk	Germantown, Phila., Pa.	3½	23	0	0
Dr. William Pepper	Melrose Park, Pa.	18	1053	9	1
Horace Groskin	Ardmore, Pa.	6	793	18	1
Mr. and Mrs. J. A. Gillespie	Glenolden, Pa.	23	1095	58	2
A. L. Baily, III	West Chester, Pa.	1½	80	0	0
A. L. Baily, III	Westtown, Pa.	1	117	0	0
Driver, Hawksley and Remington	Elsah, Ill.	5½	234	4	0
Coburn, Llewellyn, Robbins and Stewart	Bowie, Md.	5	574	9	0
W. M. Davidson	Takoma Park, Md.	12	466	11	1
A. E. Clattenburg, Jr.	Chevy Chase, Md.	1	47	1	0
A. E. Clattenburg, Jr.	Washington, D. C.	1	13	0	0
Harry S. Bristow, Jr.	Cedars, Del.	2½	45	4	0
Leon J. Cool, Jr.	Church Falls, Va.	1½	52	0	0
Mrs. Amelia R. Laskey	Nashville, Tenn.	10½	533	17	0

TABLE 1—*Continued*

Bander	*Location (north to south)*	*Years of banding*	*Total banded*	*Returns*	*Recoveries*
Ben B. Coffey, Jr.	Memphis, Tenn.	4	1074	0	1
Mrs. Rowland Thomas	N. Little Rock, Ark.	6½	295	50	0
Prof. R. E. Ware	Clemson, S. C.	8	2096	26	0
R. J. Fleetwood	Round Oak, Ga.	5	52	0	0
Dr. William Pepper	Pawley's Isl., S. C.	12	260	16	2
	Total		43000	286	41

By far the greatest number of White-throated Sparrows are trapped and banded during the fall migration. At this time their numbers, swollen by birds of the year, are at a peak; the southward movement is more leisurely than the northward journey, and there appear to be more banders active along its migration routes than in the southern wintering areas or the northern breeding grounds. Few coöperators band nesting individuals.

LONGEVITY: RETURNS AND RECOVERIES [1]

When a banded bird is taken as a return or recovery, a slight penetration is made in the mystery surrounding its life expectancy, its tendency to return to familiar places, its migration and its distribution. The large number of return and recovery records at hand—388—furnishes a fairly reliable index to the White-throated Sparrow's life span.

TABLE 2

LIFE EXPECTANCY OF THE WHITE-THROATED SPARROW

Age	*Returns*	*Recoveries*	*Total*	*Per cent of entire quantity*
Less than 1 year	0	63	63	16.3
At least 1 year	155	20	175	45.1
At least 2 years	77	12	89	22.9
At least 3 years	30	3	33	8.5
At least 4 years	14	1	15	3.9
At least 5 years	7	2	9	2.5
At least 6 years	1	0	1	.2
At least 6½ years	0	1	1	.2
At least 7 years	1	0	1	.2
At least 8 years	1	0	1	.2
Total	286	102	388	100.0

As shown in table 2, although there were 63 records of birds recovered within a year of the date of banding, there were no such return records. There are two reasons for this. First, it was possible to calculate back to the probable, or at least possible, date that the bird was hatched. Thus a wintering bird banded in April and re-

[1] Return—A bird that has returned to the place of banding after a migration period. Recovery—A bird trapped or found dead at least five miles from the place of banding.

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trapped in October of the same year was at least one year old when taken as a return, even though only six months had elapsed after it was banded. Second, a bird banded in the fall and retrapped at the same station in the succeeding spring had very likely wintered in the vicinity and would not be considered a return at all. It should be pointed out, however, that a bander operating on the nesting grounds could band a young bird in July or August and retrap that bird the following May or June, thereby securing a valid return on a bird less than a year old.

Especially noteworthy is the fact that 63 of the 102 recoveries reported were birds found dead within a year of being banded. Of these 63 birds, 57 were secured at points distant from the banding station, indicating that they were migrating when banded. Only five of these 57 birds found dead were traveling northward; the remaining 52 were headed south. The data therefore suggest a high mortality among migrant White-throated Sparrows, especially among southbound birds. F. C. Lincoln (1939: 60–61) writes of a disaster, which overtook a large number of migrant birds as they crossed over Lake Huron. Included among the many thousands of bodies washed up on the beaches were numerous White-throated Sparrows.

Among the birds which had survived two or three migrations before recapture as return-1[1] individuals, there also appears a sharp reduction in numbers. Whereas 155 records of return-1 White-throated Sparrows were received, there were but 77 reports of birds at least two years old when retrapped. It is not claimed that only 77 of the original 155 were still alive two years after being banded for these represent only those trapped. Another marked decrease apparently takes place among the return-2 birds, for the records show but 30 return-3 birds and a steady decline with each additional year.

The data on hand were examined to see if the White-throated Sparrows that had returned were regularly retrapped in previous or succeeding breeding or wintering seasons. In the 77 return-2 records, 38 had also been taken as return-1's; the remaining 39 had been retrapped only as return-2 individuals. Then the return-3 through return-5 records were reviewed and the findings tabulated. The single return-6 bird was previously taken as a return-1 and as a return-5. Neither the return-7 nor the return-8 was ever recaptured prior to the single return record which each eventually provided.

[1] By return-1 it is meant a bird that is approximately a year old when retrapped at the place of banding. A return-2 would thus be about two years old even though it may have been the first time the bander recaptured it. The number in such an expression signifies the bird's approximate age.

TABLE 3

FREQUENCY OF RECAPTURE OF 30 RETURN-3 WHITE-THROATED SPARROWS

Retrapped as return-1	x x x x x x x x x x x x x x 0 0 0 0 0 0 x x x x x x x x 0 0 0
Retrapped as return-2	x x x x x x x x x x x x x x 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 x x x

Key:—x—retrapped; 0—not retrapped.

TABLE 4

FREQUENCY OF RECAPTURE OF 14 RETURN-4 WHITE-THROATED SPARROWS

Retrapped as return-1	*Retrapped as return-2*	*Retrapped as return-3*
x	x	x
0	0	0
0	0	0
0	0	0
0	0	0
0	0	x
0	0	x
0	0	x
0	x	x
0	x	x
0	x	x
x	0	0
x	0	0
x	x	0

TABLE 5

FREQUENCY OF RECAPTURE OF 7 RETURN-5 WHITE-THROATED SPARROWS

Retrapped as return-1	*Retrapped as return-2*	*Retrapped as return-3*	*Retrapped as return-4*
x	x	x	x
x	x	x	x
0	0	0	0
0	0	0	0
x	0	0	0
x	0	0	0
x	x	0	0

Data submitted show that the overwhelming majority of returns are secured at the White-throated Sparrow's breeding and wintering areas. Table 1 substantiates this thought. Certain banders operating in neither the recognized breeding nor wintering areas of this species report a large number of returns in comparison with other banders at no great distance from them. This is explained by the fact that White-throated Sparrows may winter in sheltered places as far north as New England. An example of such a place is the Gill banding station at Huntington, Long Island, New York, situated on the side of a hill whose opposite side was planted some twenty years ago with several acres of Scotch Pine as a small forestry project. The banding stations of Horace Groskin at Ardmore, Pennsylvania, and particularly the station of Mr. and Mrs. John A. Gillespie at Glenolden, Pennsylvania, are similarly situated and afford excellent

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wintering sites for this species with unlimited food supplies at the near-by banding stations.

Returns of migrant birds are very rare, if indeed they occur at all. Mrs. Rowland Thomas of North Little Rock, Arkansas, operating on the wintering grounds, had 50 returns from 260 birds, whereas the late W. I. Lyon banded 20,000 transients on the western shore of Lake Michigan without getting a single return. It is apparent that migrant White-throated Sparrows seldom select the same stop-over points on subsequent journeys. (Two banders, Karl E. Bartel at Blue Island, Illinois, and Robert E. Stewart at the Patuxent Research Refuge, Bowie, Maryland, made special concerted attempts to trap these sparrows during the 1943–1944 migratory and wintering season. They especially wanted returns of their own birds and recaptures of White-throated Sparrows banded by other operators (foreign banded birds). Mr. Bartel captured 600 White-throats at Blue Island, but none of them carried bands. Since the species does not winter in his area, he would more likely retrap foreign-banded birds than his own marked individuals. At Bowie, Mr. Stewart trapped 744 unbanded White-throats in addition to 13 returns. No foreign birds were taken.)

Practically all banders whose work is confined largely to migrants have no returns for this species, but they have obtained most of the recovery records. (Mr. Lyon had at least 14 such recoveries.) Many banders lament this lack of return records. They wonder if they should continue to band this species. The authors believe that recovery records are fully as necessary and valuable as return records, especially for investigating the bird's migration and distribution, and that coöperators should band as many White-throated Sparrows as possible, for only thus can data accumulate which will explain this bird's migration.

Experience with marked birds indicates that most species, especially the adults, tend to return to their former breeding and wintering areas. Care has been taken to say "tend to return," and we must continue to use that expression, for it best describes our present knowledge even within a given species. There is, for example, the record of a White-throated Sparrow that wintered during 1925–1926 in New Haven, Connecticut, and then was found "exhausted in a snow-drift" on March 5, 1927, at Kinston, North Carolina (Hubbard, 1927: 48). There may be more shifting of breeding and wintering areas from year to year than this single record would suggest.

RECOVERIES OF SOUTHBOUND OR WINTERING BIRDS

The extensive data on interstate recoveries of White-throated Sparrows supplied by the Fish and Wildlife Service were carefully reviewed. (Mr. Robbins believed these were practically complete through June, 1940.) From them was extracted each record of a bird banded in one state and recovered in another during the fall migration or before any northward movement took place. August 1 of any year and March 15 of the following year were taken as inclusive dates. August was selected because it is a time when no birds are arriving on the breeding grounds and, in addition, it is a month during which little or no southward movement takes place. March 15 was chosen as the spring deadline because northward migration probably commences in the latter part of that month, at least in the northern portion of the wintering area.

There were 56 records of southbound or wintering individuals as against only five northbound or breeding birds. These 56 records are tabulated in Table 6.

TABLE 6

POINTS OF BANDING AND RECOVERY OF 56 SOUTHBOUND WHITE-THROATS

	State recovered									
State banded	*N. Y. (L. I.)*	*N. J.*	*Md.*	*Va.*	*N. C.*	*S. C.*	*Ga.*	*Ala.*	*Ark.*[1]	*Tex.*[2]
Ontario								1		
Maine					2	1	1			
New Hampshire				2	1					
Massachusetts	1	2	1	1	3	6	2			1
Connecticut					1					
New York			1	1	4	4	2		2	
Pennsylvania				1	2	4		2		
New Jersey			1		4		1			
Washington, D. C.						1				
Totals—56	1	2	3	5	17	16	6	3	2	1

[1] Arkansas is in the Mississippi Flyway (*see* p. xxx).
[2] Texas is in the Central Flyway (*see* p. xxxxx).

The data on interstate recoveries of White-throated Sparrows banded in the Atlantic Flyway were reëxamined for all records of birds believed to be wintering at their places of recovery. December 1 through March 15 was considered to be the wintering season. The beginning of December was selected because there probably is some southward movement up to that time. (Termination of the fall migration will be discussed later.) The reason for choosing March 15 has been stated.

In this instance the date of banding is not a consideration as it was with the records appearing in Table 6. Therefore, one or more

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migrations had taken place between the dates of banding and recovery. In addition, no attention is given to the states where these birds were banded. The 22 records in this group were added to the 56 in Table 6, and the total of 78 recoveries are summarized in Table 7. For purposes of comparison, but especially to show that the distribution among the various states was substantially unchanged, the data of Table 6 are presented as a part of Table 7.

TABLE 7

POINTS OF RECOVERY OF 78 WHITE-THROATED SPARROWS

State recovered	*Combined total of Tables 6 and 7*	*Data of Table 6 alone*
New York (L. I.)	1	1
New Jersey	4	2
Maryland	3	3
Kentucky	1	0
Virginia	6	5
North Carolina	26	17
South Carolina	24	16
Georgia	7	6
Alabama	3	3
Arkansas	2	2
Texas	1	1
Totals	78	56

Fifty of the 78 recoveries are from North and South Carolina, indicating that the bulk of the eastern White-throated Sparrows winter in those two states. Progressively smaller numbers of wintering birds are encountered as one travels north or south. That the Carolinas harbor many of the wintering White-throated Sparrows has been suggested by Beals and Nichols (1941: 104).

The status of Alabama as a wintering area for Atlantic Flyway White-throats is worthy of mention. Only the southern portion of the state is considered to be within the Mississippi Flyway; the state's eastern boundary barely reaches the western limits of the Atlantic Flyway (Lincoln, 1939: 153, 167). It might be expected, therefore, that a few birds would come down the coastal route and eventually reach Alabama, while a greater proportion would migrate along the interior pathway and also reach that state. Three records of birds that flew down the Atlantic Flyway and 15 that arrived via the Mississippi Flyway indicate the validity of this supposition.

THE SPEED OF SOUTHWARD MIGRATION

The southward migration of the White-throated Sparrow is usually regarded as leisurely, with stop-over periods ranging from a day to a week or more. The data have provided a few clues to speeds

attained. It is probable that each White-throat makes a long overnight flight and then rests and feeds for a day or more before resuming its journey. If there were thirty or forty records of birds banded at one station and retrapped the following day at another, a reasonably accurate picture of the White-throated Sparrow's speed of migration could be presented with the distance covered in each flight. Unfortunately, out of 227,334 individuals banded through June, 1943, there is only one such record. That was the bird banded by the late W. I. Lyon at Waukegan, Illinois, at 6:30 p. m. on October 5, 1937, and retrapped at 7:30 the following morning by Karl E. Bartel at Blue Island, Illinois. The distance covered was 60 miles directly south. At the present rate, it will be many years before sufficient records like this one are accumulated.

In lieu of the kind of data needed, records were selected that gave, however scantily, some indication of the average number of miles covered per day. To make the picture as accurate as possible, all averages below ten miles a day were discarded. Possibly all records under 20 miles should have been omitted, for in view of the record above it does not seem likely that a White-throated Sparrow would travel less than 20 miles in a night's flight. These averages conceal at least as much as they reveal. If it is assumed that each bird rested one day after each flight on its journey—and there are indications that this actually happens—then all the averages in Table 8 would be doubled. It is probable that these birds rest more than a single day, and the delay in capture at a banding station is the main source of error.

TABLE 8

AVERAGE SOUTHWARD SPEED OF WHITE-THROATED SPARROWS

Place banded	*Date banded*	*Date recovered*	*Place recovered*	*Distance covered*	*Miles per day*
Andover, Mass.	10/7/35	12/9/35	Pink Hill, N. C.	640	10
Demarest, N. J.	10/6/41	11/13/41	Bowie, Md.	230	11
Fargo, N. D.	9/21/38	11/26/38	Miller, Ark.	811	12
Shirley, Mass.	10/16/38	12/27/38	Tennille, Ga.	920	12
Mohonk Lale, N. Y.	10/4/31	11/11/31	Mocksville, N. C.	540	14
Sherrill, N. Y.	10/8/32	12/29/32	McGehee, Ark.	1080	13
Elmhurst, L. I., N. Y.	9/29/38	11/4/38	Graniteville, S. C.	660	18
Groton, Mass.	10/11/28	11/29/28	Cordele, Ga.	1020	20
Athol, Mass.	10/18/32	11/22/32	Gastonia, N. C. (T)	710	20
Swampscott, Mass.	10/16/32	11/19/32	Nichols, S. C.	750	22
Platteville, Wis.	10/15/40	11/7/40	Blacksburg, Va.	660	28
Fairmont, N. D.	9/30/37	10/6/37	Minneapolis, Minn.	173	29
Swampscott, Mass.	10/20/32	10/29/32	Bridgeton, N. J. (T)	310	34
Waukegan, Ill.	10/5/37	10/6/37	Blue Island, Ill.	60	60

(T)—Trapped at banding station.

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TERMINATION OF THE SOUTHWARD MIGRATION

Since there are records of southbound White-throated Sparrows recovered before they undertook another migration, it is possible to give an approximate date when migrants cease to pass through the northern states, that is, from southern New Jersey northward. Records of White-throated Sparrows banded in November and subsequently recovered farther south include only five, none banded after November 19 and none in December.

TABLE 9

MIGRANT WHITE-THROATS BANDED IN NOVEMBER AND RECOVERED FARTHER SOUTH

Place banded	*Date banded*	*Date recovered*	*Place of recovery*
Wyncote, Pa.	11/5/32	1/2/33	Essex, N. C.
Manchester, N. H.	11/9/32	12/26/32	Sarah, Va.
Washington, D. C.	11/9/38	2/2/39	Galivants Ferry, S. C.
New Haven, Conn.	11/11/32	12/29/32	Enfield, N. C.
Milton, Mass.	11/19/37	1/31/38	Pittsville, Md.

The data are inadequate to justify any rigid statement, hence we venture only to say that the height of the migration has passed by mid-November, and that there probably is little or no southward movement after that date. Northern banders who trap considerable quantities of White-throated Sparrows note a decline in numbers at about this time, but unbanded birds keep appearing even after Christmas. It is believed that these new birds had arrived some time before and were still wandering about the bander's locality in search of suitable feeding and roosting places. There is always the possibility that the birds may have been frequenting the bander's station for many weeks before being captured.

RECOVERIES OF NORTHBOUND AND BREEDING BIRDS

Among the data sent in, there were but five records of White-throated Sparrows banded on their wintering grounds and subsequently recovered either as northbound or as breeding birds. This small number of records, compared to the 56 recoveries of southbound and wintering birds, was the result of a number of factors. Spring migration is of shorter duration, since the birds are impelled northward by the urge to mate and reproduce. Stop-over periods are thus shorter, and the possibility of banded birds being retrapped by some other operator are substantially reduced. Most of the banded White-throated Sparrows found dead are about yards and gardens, but in spring they visit these places less often. Their breeding sites are located in areas thinly populated by humans, so dead birds are

seldom found. Whenever banded White-throated Sparrows die in spring, summer or fall, their bodies are usually hidden in vegetation.

Not only are the five records inadequate in themselves, but each covers a time interval too large to warrant any conclusions as to speed of the northward movement, or the beginning or end of migration. In the North, migrants pass through from early April to late May. Perhaps a way to tell if an unbanded bird is a migrant is by noting its plumage. Birds wintering at a bander's station, and repeating in his traps, begin to exhibit gradual changes toward breeding plumage, especially about the head, in early April. At the same time, unbanded birds in full breeding plumage appear in the traps. These birds may be migrants newly arrived from the south.

OTHER ASPECTS OF MIGRATION

In addition to reporting yearly fluctuations in the numbers of White-throated Sparrows trapped, few banders capture equal numbers of spring and fall migrants. The majority catch more fall than spring migrants. Stack and Harned (1944: 3) suggest that White-throated Sparrows are more inclined to accept artificial baits in spring, for their supply of natural food is then very small. Yet some banders, who consistently operate their traps, regularly capture many more birds in the fall. It would seem, therefore, that part of the explanation for different seasonal captures is also to be found in the location of the banding station. The authors of this paper operate 30 miles apart on the north shore of Long Island, New York, and both take most of their White-throats during the fall migration. However, Fischer is west of Gill's station and therefore nearer the Hudson River flight lane; he sees and captures many more birds. Both stations have approximately equal numbers of traps and both are operated about the same length of time each day.

Field students on Long Island are well aware of the fact that most, if not all, of the passerine migrants become more abundant as one approaches the Hudson River migration lane, one of the branches in the greater Atlantic Flyway. It is probable that wherever large numbers of migrant White-throated Sparrows are taken, the station is situated on or near a major flyway or one of its tributaries. When considerable numbers of migrating birds are seen and but few are captured, such factors as nearness of fresh water, abundant supply of natural food, etc., are operating against the bander.

The fact remains, however, that some of the active, efficient stations regularly band a greater number of spring migrants. These stations are all inland, and are 100 miles or more from the major

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arteries of the Atlantic Flyway. It is surmised that these stations lie along migration pathways used largely by northbound White-throats. Why this species should use some routes to a greater extent in spring than in fall, or vice versa, is difficult to explain; nevertheless, such is apparently the case. This and other complex aspects of the White-throated Sparrow were noted by Stack and Harned (1944: 3) in their study.

One of the most intriguing aspects of the White-throated Sparrow's migration encountered in this study involved the crossing of certain birds from one major flyway to another. Ten records at hand include birds from the Atlantic Flyway and from the Mississippi Flyway. C. H. Sanderson at Sherrill, New York, banded one bird on October 8, 1932, which was found dead at McGehee, Arkansas, December 29, 1932. Another trapped October 13, 1931, was found dead at Rector, Arkansas, May 3, 1932. The two points of recovery are 190 miles apart; both are within 40 miles of the Mississippi River. Presumably these two birds started southward in the Atlantic Flyway and subsequently crossed over into the Mississippi Flyway.

Raymond J. Middleton banded a bird at Norristown, Pennsylvania, on October 4, 1930, which was retrapped by Mrs. Fred L. Hook of South Milwaukee, Wisconsin, April 26, 1937. On one of the many migrations that took place in the six years embraced by this record, the bird left the Atlantic and entered the Mississippi Flyway.

The most remarkable of these records is one wherein a White-throated Sparrow banded at Groton, Massachusetts, by Edwin A. Mason in October, 1939, was found dead at "Mt. Horne," Texas, January 28, 1940 (Mason, 1941: 5). The latest Rand and McNally Atlas and Marketing Guide, the most complete map of its kind, does not show a town named Mt. Horne, but it does have a place called Mountain Home. Perhaps the person who reported the dead White-throat wrote a hasty letter and abbreviated Mountain. When written quickly, 'Home' could easily be mistaken for 'Horne.' It is our belief that an error is involved here and that the point of recovery is actually Mountain Home, a town 68 miles northwest of San Antonio. Nevertheless, this bird not only departed from the Atlantic Flyway, but crossed entirely over the Mississippi Flyway and entered the Central Flyway, where it was doubtless wintering when recovered.

The remaining six records represent White-throats that crossed from the Mississippi to the Atlantic Flyway. One, banded at Wilmette, Illinois, on October 4, 1929, by Ted G. Delang was found dead December 27, 1932, at Andrews, South Carolina. A second, cap-

tured May 16, 1930, by Henry E. Wagner at Detroit, Michigan, was recovered at Tabor, North Carolina, on March 12, 1932. Both these birds were recovered in the heart of the eastern wintering area of White-throated Sparrows.

A bird banded October 15, 1940, by Carmen Beining at Platteville, Wisconsin, was trapped by C. O. Handley at Blacksburg, Virginia, on November 7, 1940. The flight covered 660 miles, and the bird averaged 28 miles a day. Another White-throated Sparrow caught at Platteville by Carmen Beining, May 7, 1932, was recaptured January 6, 1933, at Wyncote, Pennsylvania, by William Pepper, Jr. This record is noteworthy in that the bird probably migrated northward in the Mississippi Flyway and, after nesting, entered the Atlantic Flyway and presumably wintered therein.

Lastly, two individuals which Clarence Bretsch marked at Gary, Indiana, have been secured in the Atlantic Flyway. One captured October 20, 1932, was retrapped at Silver Spring, Maryland, April 30, 1934. The other caught April 30, 1938, was recovered at Harlem, Georgia, on February 10, 1942.

The true nature and extent of this fascinating trait of the White-throated Sparrow remains a challenge to every bander. Several students have written regarding the "winter group habit" of these birds and William P. Wharton (1935:128) suggests a mating attachment that may persist after the breeding season and influence the choice of wintering areas. Such theories may point to a solution of much that remains unknown. It is the writers' hope that this paper will encourage every bander to band this species in even greater numbers, and, whenever opportunities arise, to band entire families on their breeding grounds.

In the following Table 10 there are given all records known to the writers of a White-throated Sparrow banded in one state and recovered in a different state.

TABLE 10

INTERSTATE WHITE-THROATED SPARROW RECOVERIES

Atlantic Flyway

Bander	*Place banded*	*Date*	*Place recovered*	*Date*
J. P. Wetherill, Jr.	Winter Harbor, Me.	9/6/35	Louis, S. C.	2/—/36
Effie A. Anthony	Bar Harbor, Me.	4/25/33	Millburn, N. J.	c 5/2/34[1]
Alice C. Wolfe	So. Waterford, Me.	8/18/26	Pitt Co., N. C.	c 3/5/27
W. Rodman Peabody	Northeast Harbor, Me.	8/25/36	Black Creek, N. C.	12/13/36
B. W. McPheters	Bar Harbor, Me.	8/15/32	Reynolds, Ga.	12/15/32
Fr. E. Goellner	Manchester, N, H.	10/21/32	South Boston, Va.	3/20/34
Fr. E. Goellner	Manchester, N. H.	10/10/37	Seminary, Miss.	4/30/38
Fr. E. Goellner	Manchester, N. H.	11/9/32	Sarah, Va.	12/26/32
R. P. Marsden	Hanover, N. H.	4/30/29	Tabor, N. C.	12/24/29

[1] c.—Date approximate.

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TABLE 10—*Continued*

Bander	*Place banded*	*Date*	*Place recovered*	*Date*
R. P. Marsden	Hanover, N. H.	4/30/29	Florence, S. C.	1/30/30
Richard L. Weaver	Hanover, N. H.	10/13/39	Woodsdale, N. C.	2/8/40
H. C. Fortner	Burlington, Vt.	5/3/29	Newton Grove, N. C.	11/12/29
Leslie Crane	Rutland, Vt.	5/2/32	Sayabec, Quebec	c 8/13/32
Arthur Morley	Swampscott, Mass.	10/16/32	Nichols, S. C.	11/19/32
Arthur Morley	Swampscott, Mass.	10/20/32	Bridgeton, N. J.	T10/29/32[1]
Arthur Morley	Swampscott, Mass.	10/16/31	Atlantic City, N. J.	12/9/31
Arthur Morley	Swampscott, Mass.	10/18/31	Cambridge, Md.	2/28/34
Robert Allison	Athol, Mass.	10/5/35	Nichols, S. C.	1/31/36
Robert Allison	Athol, Mass.	10/20/32	Raeford, N. C.	c 3/28/33
Robert Allison	Athol, Mass.	10/18/32	Gastonia, N. C.	T11/22/32
E. M. Davis	Shirley, Mass.	10/21/38	Capron, Va.	c 1/29/40
E. M. Davis	Shirley, Mass.	10/22/38	Wilmington, N. C.	1/2/39
E. M. Davis	Shirley, Mass.	10/16/38	Tennille, Ga.	12/27/38
E. M. Davis	Shirley, Mass.	10/6/39	Dandy, Va.	1/6/40
William P. Wharton	Groton, Mass.	10/8/33	Little Bartibogue, N.B.	9/16/35
William P. Wharton	Groton, Mass.	10/11/28	Cordele, Ga.	11/29/28
William P. Wharton	Groton, Mass.	9/26/42	Bowie, Md.	5/7/43
O. L. Austin	N. Eastham, Mass.	10/2/30	Ravenels, S. C.	2/—/31
O. L. Austin	N. Eastham, Mass.	10/15/36	Elmhurst, L. I., N. Y.	12/16/36
W. Rodman Peabody	Milton, Mass.	10/13/30	N. Charleston, S. C.	1/27/31
W. Rodman Peabody	Milton, Mass.	11/19/37	Pittsville, Md.	1/31/38
R. M. Hinchman	Milton, Mass.	10/7/32	Summerville, S. C.	3/13/33
S. M. Pell	Lenox, Mass.	10/9/33	Pine Tops, N. C.	12/30/38
M. L. Shields	Andover, Mass.	10/7/35	Pink Hill, N. C.	12/9/35
Hildegarde Thorp	Amherst, Mass.	10/11/31	Lowell, N. C.	c 4/26/32
Mrs. F. D. Hubbard	New Haven, Conn.	11/11/32	Enfield, N. C.	12/29/32
Mrs. F. D. Hubbard	New Haven, Conn.	12/9/25	Kinston, N. C.	3/5/27
Miss C. M. Teot	New Haven, Conn.	4/24/29	Florence, S. C.	1/30/30
Harold L. Hutchins	Hamden, Conn.	5/12/40	Pawley's Is., S. C.	1/16/41
Mrs. M. V. Beals	Elmhurst, L. I., N. Y.	11/1/30	Silver Spring, Md.	11/11/32
Mrs. M. V. Beals	Elmhurst, L. I., N. Y.	10/15/37	Prosperity, S. C.	1/15/38
Mrs. M. V. Beals	Elmhurst, L. I., N. Y.	10/14/35	Florence, S. C.	2/3/36
Mrs. M. V. Beals	Elmhurst, L. I., N. Y.	10/14/36	Olanta, S. C.	2/3/38
Mrs. M. V. Beals	Elmhurst, L. I., N. Y.	11/26/36	W. Englewood, N. J.	3/5/38
Mrs. M. V. Beals	Elmhurst, L. I., N. Y.	10/22/32	Mullens, S. C.	2/20/36
Mrs. M. V. Beals	Elmhurst, L. I., N. Y.	10/12/38	Whiteville, N. C.	1/16/39
Mrs. M. V. Beals	Elmhurst, L. I., N. Y.	10/7/38	Berlin, Md.	2/6/39
Mrs. M. V. Beals	Elmhurst, L. I., N. Y.	11/11/36	Maplewood, N. J.	c11/12/39
Mrs. M. V. Beals	Elmhurst, L. I., N. Y.	9/29/38	Graniteville, S. C.	11/4/38
Arthur A. Allen (?)	Ithaca, N. Y.	4/29/20	Cumming, Ga.	1/15/21
Verdi Burtch	Branchport, N. Y.	4/30/40	Trimmonsville, S. C.	12/25/40
R. & G. Ralston	L. I. City, L. I., N. Y.	2/6/36	Belle Cote, N. Scotia	Fall '37
A. K. Smiley, Jr.	Mohonk Lake, N. Y.	10/3/30	Rockingham, N. C.	4/7/31
A. K. Smiley, Jr.	Mohonk Lake, N. Y.	10/4/31	Mocksville, N. C.	11/11/31
A. K. Smiley, Jr.	Mohonk Lake, N. Y.	9/26/32	Fair Bluff, N. C.	12/3/32
C. K. Sanderson	Sherrill, N. Y.	10/8/32	McGehee, Ark.	12/29/32
C. H. Sanderson	Sherrill, N. Y.	10/13/31	Rector, Ark.	5/3/32
Florence K. Daley	Oliverea, N. Y.	10/19/39	Lithonia, Ga.	c 3/8/40
Verdi Burtch	Branchport, N. Y.	10/6/39	Dyer, Tenn.	12/6/40
H. A. Southerland	Hall, N. Y.	5/5/24	Boxley, Ga.	1/15/30
William Vogt	Wantagh, N. Y.	10/9/32	Haw River, N. C.	4/2/34
Edward M. Davis	Shirley, Mass.	10/18/37	Flushing, N. Y.	11/17/37
Forrest A. Dilling	Bowmanville, Ont.	10/5/41	Montgomery Co., Ala.	4/10/44
Ralph E. DeLury	Ottawa, Ont.	10/14/30	Morris, Ala.	1/5/31

[1] T.—Trapped by a bander.

TABLE 10—*Continued*

Bander	*Place banded*	*Date*	*Place recovered*	*Date*
B. S. Bowdish	Demarest, N. J.	10/28/39	Augusta, Ga.	2/—/40
B. S. Bowdish	Demarest, N. J.	10/3/35	Monck's Corner, S. C.	1/1/38
B. S. Bowdish	Demarest, N. J.	10/11/38	Williamston, N. C.	2/—/39
B. S. Bowdish	Demarest, N. J.	10/5/33	Claredon, N. C.	3/2/34
B. S. Bowdish	Demarest, N. J.	4/27/30	Maxton, N. C.	2/1/32
Dumont Banding Sta.	Pequannock, N. J.	9/23/38	Fayetteville, N. C.	12/27/38
Dumont Banding Sta.	Pequannock, N. J.	10/16/37	Lenoir, N. C.	10/13/38
Keohon Garland	Demarest, N. J.	10/26/41	Bowie, Md.	11/14/41
B. K. Matlack	Bridgeton, N. J.	11/4/25	Barnwell, S. C.	3/23/26
B. K. Matlack	Bridgeton, N. J.	10/29/33	Littleton, N. C.	2/9/36
Mrs. A. N. Pack	Princeton, N. J.	9/30/32	Walstonburg, N. C.	12/22/32
Mrs. Chas. L. Bull	Oradell, N. J.	4/28/31	Herbert Office, Kent Co., N. B.	6/—/32
R. J. Middleton	Norristown, Pa.	10/18/34	Bethel, N. C.	2/1/36
R. J. Middleton	Norristown, Pa.	10/9/35	Camden, S. C.	3/15/36
R. J. Middleton	Norristown, Pa.	10/15/23	Paoli, Pa.	10/26/23
R. J. Middleton	Norristown, Pa.	10/8/31	Hope Mills, N. C.	1/15/33
R. J. Middleton	Norristown, Pa.	10/17/34	Galivants Ferry, S. C.	12/10/34
R. J. Middleton	Norristown, Pa.	10/3/38	Ridgeland, S. C.	3/10/39
R. J. Middleton	Norristown, Pa.	10/12/38	Waderboro, N. C.	2/1/40
R. J. Middleton	Norristown, Pa.	5/5/41	Hemingway, S. C.	1/10/42
R. J. Middleton	Norristown, Pa.	10/8/28	Manchester, N. H.	4/29/30
R. J. Middleton	Norristown, Pa.	10/4/30	S. Milwaukee, Wis.	4/26/37
R. J. Middleton	Norristown, Pa.	5/2/35	St. Pauls Is., N. S.	5/8/38
Dr. William Pepper	Melrose Park, Pa.	12/2/38	Severn, Va.	2/2/39
Dr. William Pepper	Pawleys Isl., S. C.	4/20/37	Auburn, N. Y.	10/1/41
William Pepper, Jr.	Wyncote, Pa.	11/5/32	Essex, N. C.	1/2/33
William Pepper, Jr.	Wyncote, Pa.	10/29/36	Windham Center, Vt.	11/15/39
Henry P. Baily	Overbrook, Pa.	10/12/33	White Stone, Va.	3/1/34
Henry P. Baily	Overbrook, Pa.	10/15/39	Russellville, Ala.	3/8/40
J. A. Gillespie	Glenolden, Pa.	10/30/32	Vaucluse, S. C.	11/9/34
J. A. Gillespie	Glenolden, Pa.	10/27/38	Chester, S. C.	1/5/39
Horace Groskin	Ardmore, Pa.	10/29/38	Aberdeen, N. C.	12/10/38
H. D. McCann	Paoli, Pa.	10/30/32	Wetumpka, Ala.	3/13/33
William Davidson	Takoma Park, Md.	5/5/39	Colon, N. C.	3/10/41
Alfred O. Ramsay	McDonough, Md.	11/3/33	Effingham, S. C.	11/15/34
Fr. Edward Stoehr	Washington, D. C.	11/9/38	Galivants Ferry, S. C.	2/2/39
I. H. Johnston	Charleston, W. Va.	12/6/24	Bamen, Ky.	3/15/26
William P. Wharton	Summerville, S. C.	2/22/33	Four Oaks, N. C.	12/22/33
William P. Wharton	Summerville, S. C.	3/13/33	Concord, N. C.	11/6/33
William P. Wharton	Summerville, S. C.	3/22/34	Tuberville, S. C.	1/31/36
William P. Wharton	Summerville, S. C.	1/19/34	St. John, N. Scotia	8/10/34
William P. Wharton	Summerville, S. C.	2/20/36	Millertown, N'f'dl'd.	8/6/36
William W. Neely	Chester, S. C.	2/18/40	L'anse au Griffin Twp., Gaspé Co., Quebec	6/15/40
Mrs. Mabel T. Rogers	Milledgeville, Ga.	2/8/52	West Chester, Pa.	4/18/42
Mrs. Mabel T. Rogers	Milledgeville, Ga.	3/5/39	Meadows of Dan, Va.	5/9/39
Clarence Bretsch	Gary, Ind.	10/20/32	Silver Spring, Md.	4/30/34
Clarence Bretsch	Gary, Ind.	4/30/28	Harlem, Ga.	2/10/32
Henry S. Wagner	Detroit, Mich.	5/16/30	Tabor, N. C.	3/12/32
Carmen Beining	Platteville, Wis.	10/15/40	Blacksburg, Va.	11/7/40
Carmen Beining	Platteville, Wis.	5/7/32	Wyncote, Pa.	1/6/33
Ted G. Delang	Wilmette, Ill.	10/4/29	Andrews, S. C.	12/27/32

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SUMMARY

This study is based on data submitted by 52 banders and on information provided by F. C. Lincoln and Chandler S. Robbins of the U. S. Fish and Wildlife Service.

A total of 227,334 White-throated Sparrows were banded before July 1, 1943; contributors to this study accounted for 43,000 of these, the great majority of which were banded as migrants. Records of 102 recoveries and 286 returns were submitted.

Returns are secured almost exclusively by those who band breeding or wintering birds. It is doubtful if White-throated Sparrows banded while migrating are ever taken as returns. Most of the recovery records came from banders whose work deals largely with migrants because those are the chief ones banded.

There is apparently a high mortality among migrating White-throated Sparrows, especially among birds making the southbound trip.

The wintering grounds of eastern White-throated Sparrows are centered in North and South Carolina.

It was not possible to establish an accurate average speed of southward migration. The record of a bird that made an overnight flight of 60 miles barely suggests what the species is able to accomplish.

Seasonal and yearly variations in the number of White-throated Sparrows trapped at many stations, and ten instances wherein birds crossed from one of the major flyways to another, indicate that the species has a complex migration which requires a wealth of data for its explanation.

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140–19 Beech Avenue
Flushing, New York
24 Overlook Drive
Huntington, New York

ORNITHOLOGICAL RESULTS OF THE BAFFIN ISLAND EXPEDITIONS OF 1928–1929 AND 1930–1931, TOGETHER WITH MORE RECENT RECORDS

BY J. DEWEY SOPER

(Continued from page 239)

55. Nyctea nyctea (Linnaeus), SNOWY OWL. Eskimo: *Aŭk'pik*.—On the 1928–1929 expedition the Snowy Owl was so scarce that not a single one was noted until July 12, 1929, when a solitary bird was recorded as the party ascended Blue Goose River northeast of Camp Kungovik. It was not observed again that season. During 1930–1931, at Lake Harbour, the species was comparatively rare. In the former season the writer saw only three individuals during August, none in September, and only one during October. It was not again noted up to the time of leaving the country in early August, 1931. The writer has records of the Snowy Owl nesting at Amadjuak Bay and Cape Dorset (1926), so it may be assumed that scattered pairs breed throughout southern districts. Judging from personal observations made at Pond Inlet in the late summer of 1923, the species is much commoner in far northern sections of the island.

56. Otocoris alpestris (Linnaeus), HORNED LARK. Eskimo: *Kōpĕnwâ"pâ*.—There is still some uncertainty regarding the true identity of the southern Baffin Island horned larks. The races are not easy to define, and this is especially true where ranges meet or overlap, as they obviously do on Baffin Island and apparently, as well, on Southampton Island. It now appears fairly certain, however, that southern Baffin Island birds are referable to both *hoyti* and *alpestris* (*see* Soper, 1928: 108–109, and Sutton, 1932: 211).

On the whole, the population in this territory appears to be a mixed one, but with *alpestris* characters predominant. With much more collecting carried out from eastern and western extremes, it appears probable that birds from the southeastern part of the island will prove to be the strongest in those characters which typify

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alpestris, while those to the west and north become progressively farther from this form and nearer to *hoyti* [Gross (1937: 36) refers specimens from the near-by Button Islands, Hudson Strait entrance, to *O. a. alpestris*, while Taverner (Bray and Manning 1943: 532) provisionally identified Manning's specimens from Taverner Bay, Foxe Basin, as *O. a. hoyti*]. If the above conclusions prove correct, the statements of range in the 1931 A. O. U. Check-List (pp. 212–213) will need to be modified to extend the territory of *hoyti* considerably northeast of the west coast of Hudson Bay, and *alpestris* north of Hudson Strait.

The following notes compiled at the end of the writer's 1928–1929 and 1930–1931 expeditions cannot definitely refer to the subspecies; they will have to serve the southern Baffin Island birds as a whole, concerning occurrence, relative abundance, nesting, etc.

Horned larks appear in small numbers along the south coast of Foxe Peninsula during the spring migration, but they are not known to occur or nest there during the summer. In 1928, the birds were seen only during the last days of August at Nuwata and at various places along Foxe Channel as far south as King Charles Cape. Examples were first noted at Bowman Bay on June 3, 1929, after which they occurred daily there in small numbers until June 13. During the latter half of June, only one individual was recorded, but about the Blue Goose nesting ground it was rather commonly dispersed on low granite outcrops in early July. This circumstance offered a good example of the peculiarities of local distribution, for at Camp Kungovik, only a few miles away, it was absent, though the two localities are very similar in nature. The number of larks frequenting the above area, and the volubility of the singing males, unquestionably indicated breeding, though no nests were found. With the exception of a solitary lark recorded at Cape Alberta on August 4, the bird was not observed again after we left the Bowman Bay plains on July 24. At Nettilling Lake the birds breed in abundance.

This is one of the scarcest of small land birds that visit the Lake Harbour region. During the spring migration in early June, moderate numbers were seen from day to day if considerable time were spent in the field. At the height of summer and during the autumn, it is rarely encountered, though it is known to breed there to a very limited extent. The first spring record in 1931 was represented by a small band of six individuals on June 5. From this date until June 13, a few were noted nearly every day, after which they were rarely seen. On June 25, a single individual was observed several miles up Soper River, and one was collected there three days later. On July 8, an adult pair with two young, just awing, were seen on Copeland Island in North Bay. While we were cruising along the coast in the neighbourhood of Itivirk Bay and Tanfield Cape on July 10, several were met with on rocky hillsides.

Horned larks are not nearly so common along the south coast as in the interior about Nettilling and Amadjuak lakes. The Eskimos also report them breeding in larger numbers over the higher plateau region north of Lake Harbour than in the coastal areas. This bird is very hardy and begins nesting when much snow still lingers, earlier than either the Snow Bunting or Lapland Longspur.

57. **Corvus corax principalis** Ridgway, NORTHERN RAVEN. Eskimo: *Tūl"ūauk'*. —This bird is of widespread occurrence in southern Baffin Island, and is one of the few species that figures as a relatively common permanent resident throughout. Though broadly covering an immense territory, it is often notably erratic and local in distribution, and especially so during the winter months. As the bird is largely coastal in habit, it is rather rarely observed far inland, but odd individuals or pairs may appear at random in almost any locality.

They usually nest on high cliffs overlooking the sea. This choice of site renders it both difficult and hazardous to reach the nests, so that eggs are rarely secured. On May 6, 1928, we obtained from an Eskimo a set of six fresh eggs which was taken from a cliff the previous day, at Pudla Inlet, near Dorset Harbour. It is understood from the natives that these birds sometimes nest in mid-April. The sexes necessarily take turns in covering the eggs as sub-zero temperatures may prevail at this period and occasionally into early May. Height of abundance is reached in bold, mountainous terrain near the sea, such as in the Cumberland Sound region. Ravens consistently diminish in numbers westward to the flat tundra lands bordering Foxe Basin, from which they are absent except as rare stragglers.

58. **Oenanthe oenanthe leucorhoa** (Gmelin), GREENLAND WHEATEAR. Eskimo: *Ekūl"igăk'*.—The writer's experience from 1923 on indicates conclusively that this bird is one of the rarest of the avifauna over most parts of southern Baffin Island. Previous to the expedition of 1930–1931, the few authentic records of its occurrence on the island existed only for the Cumberland Sound region. Upon reaching Lake Harbour in late July, 1930, the writer was told of a "small grayish bird with white in the tail" which had nested in a crevice of a rock near the post about a month earlier. Details made it appear certainly referable to *leucorhoa*, though nothing was seen of it during the remainder of the season. In 1931, a single example was observed on June 12, and another two days later. Nothing further developed until June 27, when a breeding pair was found on the property of the Anglican Mission; the nest was found containing six eggs.

Forbes (1938) found eleven of these birds in a restricted area in early August, 1937, at Brewster Point, Frobisher Bay, where the species was nesting. He is of the opinion that it is not as rare on Baffin Island as ornithologists have been led to believe. It is certainly more common locally along the eastern coast than earlier surmised, but it is now a well-known fact that the species is entirely absent from very large areas of the island. There are no records of its occurrence anywhere in extreme southern and southwestern Baffin Island, nor in huge tracts of the interior to the northward. Manning (Bray and Manning, 1943: 532) reports a single specimen taken at Taverner Bay—so far as known the only record for the western part of the island flanked by Foxe Basin.

59. **Anthus spinoletta rubescens** (Tunstall), AMERICAN PIPIT. Eskimo: *Ingĭk"tăyŭk'*.—The American Pipit, like the Snow Bunting, is of widespread and almost universal distribution in southern Baffin Island. In abundance, however, it varies markedly from place to place. As its preferred haunts are among the rugged hills of mountainous districts, it is found most plentiful in suitable localities along the seacoasts of the south and east, where lengthy fiords occur with their protected coastal valleys and more luxurious vegetation. The extensive lowlands of the interior are less suitable and attract a much smaller population. From the swampy tundras of the west, relieved by no outcropping granites, the birds are entirely absent, except for a few scattered individuals that resort to beach lines during migration.

In 1928, pipits were found inhabiting all suitable rocky country in Foxe Peninsula up to mid-September. They first appeared at Bowman Bay on June 4, 1929, and soon became tolerably common on the scattered granite ridges. On July 15, a nest was found with five nestlings about two days old. This nest very closely resembled that of the Snow Bunting, both in structure and situation. It was bulkily built of dead grasses under a shelving rock, but instead of a lining of ptarmigan feathers, such

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as is invariably used by the Snow Bunting, it had one firmly and neatly woven with fine, dead grasses exclusively. At Cape Alberta on July 24 a nest was found in a crevice of a low cliff overlooking the sea, holding three young not more than four or five days old; near by, on July 26, another nest was found under a boulder, with three downy juveniles of about the same age. After this, only a few scattered individuals were noted along the coast as far west as Garnet Bay.

In the Lake Harbour region, the pipit is widely distributed, and breeds freely throughout. It is customarily observed daily until about September 27, when most of the birds abruptly disappear. A few individuals, however, sometimes linger until early October. In the summer and fall of 1930 it was a comparatively common habitué of every section of the rocky country explored. The following spring it was first seen on May 29. By June 5, the birds were abundant and the males universally in song. On June 20, a nest was found embedded in the soil of a rugged hillside under cover of a protruding ledge of rock; it contained six fresh eggs, in color drab-gray, thickly and evenly speckled with cinnamon-drab. The tinkling, elfinlike melodies of the American Pipit are among the most familiar sounds of the Arctic wilderness.

60. **Acanthis hornemanni hornemanni** (Holboell), HORNEMANN'S REDPOLL. Eskimo: *Shĕtshăg"ĕăk'*.—As in other parts of Baffin Island, Hornemann's Redpoll does not appear to inhabit Foxe Peninsula during the summer months. In the autumn, however, these birds begin to make their appearance in varying numbers, usually in small flocks, but groups of upwards of one hundred individuals have been noted. Unidentified redpolls were frequently heard and seen about the lakes of the interior north to Tessikjuak Lake and Moukjunil River in late September, 1928. The first dependable record of the species in western Baffin Island came with the collection of several specimens from a flock of thirty at Dorset Harbour on October 11. Additional specimens were taken in the same locality on October 21. *Hornemanni* was not observed in the Lake Harbour region during 1930–1931. It occurs, apparently, only as an irregular migrant on Baffin Island. In Greenland it breeds north to 70 degrees but is not yet known to do so anywhere in the Canadian Arctic Archipelago.

61. **Acanthis flammea rostrata** (Coues), GREATER REDPOLL. Eskimo: *Shĕtshăg"ĕăk'*.—On the 1928–1929 expedition, unidentified redpolls were met with on August 30, at Lona Bay, near King Charles Cape. Specimens were secured from a large flock at Andrew Gordon Bay on September 27, all of which appear referable to *rostrata;* other flocks were seen in Catherine Bay the next day. Another example of this subspecies was taken at Dorset Harbour on October 10. The writer observed no redpolls in the district after October 21, though Henry Voisey reported a solitary individual on November 23.

On March 28, 1929, a solitary, darkish redpoll (apparently *rostrata*) was observed along the Foxe Basin coast in latitude 67° 28′ N., while we were en route to Hantzsch River. This was the only redpoll observed during the winter. On June 2, a single example flew over Camp Kungovik, Bowman Bay, the first and last seen during the spring and summer. Redpolls referred to this species were observed with fair regularity at Lake Harbour in 1930, from September 27 until October 24. Specimens were collected on several occasions which answer to the description of *rostrata*. In 1931, the only record is that of two unidentified individuals noted on June 4.

On the whole, redpolls are relatively scarce on the island and seem very irregular in their habits of migration. In numerous localities the writer has not encountered them at any season, but customarily they occur in the fall, not to be observed again

until the following autumn. Apparently there are no redpoll nesting records for Baffin Island.

62. **Loxia leucoptera leucoptera** Gmelin, WHITE-WINGED CROSSBILL.—Sutton (1936) records an example of this species that was secured by John T. Ford in the spring of 1933, at Lake Harbour. It appeared during three days of very stormy weather. This is evidently the first record of its occurrence north of Hudson Strait.

63. **Junco hyemalis hyemalis** (Linnaeus), SLATE-COLORED JUNCO. The writer collected a female specimen of this bird at Lake Harbour on June 2, 1931—the first record for Baffin Island. This point is some 325 miles north of the upper limit of tree growth in northern Quebec.

64. **Zonotrichia leucophrys leucophrys** (Forster), WHITE-CROWNED SPARROW. —On July 23, 1939, Peters (Shortt and Peters, 1942: 347) saw "a few" of these birds at Lake Harbour; this constitutes the first record of the species for Baffin Island. Across the strait to the southeast, Gross (1937: 38) found the species "especially abundant" at Port Burwell. Manning (Bray and Manning, 1943: 534) collected an immature female at Taverner Bay, west coast of Baffin Island, on September 17, 1939; the specimen is now in the National Museum of Canada, Ottawa. In view of the locality where it was taken, over 700 miles north of the tree limit, this is a most unusual occurrence.

65. **Calcarius lapponicus lapponicus** (Linnaeus), LAPLAND LONGSPUR. Eskimo: *Kŏw''lĕgdk'*.—The distribution of this bird on Baffin Island is in marked contrast with that of the Snow Bunting, owing to its choice of terrain of an opposite character. It inhabits localized flats of a swampy nature, but its favorite breeding grounds are wide, moist tundras interspersed with ponds and streams and studded with grassy tussocks. Such conditions are frequently available within the granitic areas proper, where rocky hills and ridges enclose green stretches almost meadowlike in character. Here the longspurs gather and nest in large numbers, filling Arctic June days with voluble rhapsodies of song. In general habits the Lapland Longspur may be said to resemble the Savannah Sparrow of more southern regions, though much of its individualistic charm rests in its Arctic associations and its wild and brilliant singing on the wing. Such ideal localities, as sketched above, occur about Nettilling Lake, along the Foxe Basin coast, and in northern Foxe Peninsula, where the birds nest in abundance. Over large, localized areas of the island, however, they are entirely absent, or appear only briefly during migration.

In the mountainous coastal areas of southern Foxe Peninsula, the longspur is seldom observed. A few pairs, however, nest in scattered, boggy valleys in association with small lakes. During the summer of 1928, the birds were seen in numbers only on the swampy, coastal plain about Nuwata. The last recorded for the season were a few small migrating flocks at Tessikjuak Lake on September 21.

The following spring the first longspurs appeared at Bowman Bay on June 4. In three days, birds of both sexes were common, and by June 10 they swarmed in thousands over the restricted strips of snow-free tundra. This great army of migrants was further augmented up to the middle of the month, when the majority moved on to more northern resorts. Large numbers remained to breed, however, and by a wide margin were the most abundant summer residents of the tundra. On June 11, the males were first heard singing half-spirited snatches of song, but the first mad outbursts of their full and brilliant repertoire was not general until June 20.

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The first completed nest, with a single egg, was found on June 26, and by July 2, sets of four or five fresh eggs were common. By July 9, sets varying from three to six eggs were usually well incubated; the larger sets examined were invariably in a more advanced state, whereas sets of two or three eggs were nearly, if not quite, fresh. This suggests the possibility that the older birds begin earlier and lay more than first-year breeders, which are probably responsible for the later and smaller clutches. The nests are compact structures of dead grass, lined with ptarmigan feathers, built securely in the side of the moss- and grass-grown tussocks well above the water and snow of the swampy lowlands.

Incubation appears to require from twelve to thirteen days. The first nestlings of the season were observed on July 13, and a few days later they were quite general. The males ceased singing between July 12 and 15, except for occasional short outbursts for a few days from a minority of individuals. At Cape Alberta, where longspurs were abundant, young were flying on July 27. The birds were seen in fair numbers on the lowlands all along the south coast of Foxe Basin to Kommanik River, and across most of the interior to Hudson Strait during the second week of August. At this time the first pronounced tendency to autumn flocking was in evidence.

The longspur nests locally throughout the Lake Harbour district, but is relatively scarce both as breeder and migrant in this part of the island. In 1931 it was first observed on June 2, when a pair was resorting to a swampy area beside a small lake. Longspurs were nowhere encountered along the coast during the remainder of the season. A few breeding pairs were seen far inland along Soper River in late June and early July. The Eskimos state that the species nests abundantly on swampy flats of the plateau country far back in the interior toward the headwaters of this stream. Where the terrain is uniformly rocky, without marshy lowlands, the race is entirely wanting, except probably for wandering flocks during migration. Consequently, it is relatively scarce in the mountainous eastern half of Baffin Island, but reaches the height of abundance on the great grass tundras of the West. In addition to the lowlands flanking Foxe Basin, the Lapland Longspur nests prolifically about Nettilling, Anadjuak, and Mingo lakes; to a somewhat lesser extent along the lake-chains west of Nettilling Fiord, and north of Amadjuak Bay, respectively; and on broken, grassy plains immediately north of Chorkbak Inlet.

66. **Plectrophenax nivalis nivalis** (Linnaeus), EASTERN SNOW BUNTING. Eskimo: *Kōp'enūaŭk"*.—The Snow Bunting is practically omnipresent in the granite areas of Baffin Island, from mid-May until mid-October, and, on the whole, constitutes the most abundant land bird of the territory. Nothing is more charming to the traveller than these friendly and confiding birds as they soar and sing over the dreary wastes of the Arctic lands. Their songs are exquisite outbursts of melody rendered from rock perches or, lark-fashion, upon the wing. Evidently no place however desolate and repellent in the Far North but may be occupied by these birds, where they spend more than a third of their lives and rear their young.

In the summer of 1928 the birds were found abundant everywhere along the rock-bound coasts of Foxe Peninsula and over granite areas of the interior. The first signs of autumn flocking were noted in late August, a feature that was very pronounced two weeks later. Numbers gradually diminished after September 20 until the last, hardy stragglers finally disappeared on October 14. An Eskimo reported a single individual near Cape Dorset on January 26, 1929, which was the first true winter record for Baffin Island.

The Snow Bunting is exceedingly hardy; it is the first small land bird to arrive in the spring and the last to leave in the autumn. In southern Baffin Island the first

intrepid males arrive by the first week of April, but the migration is not pronounced until the middle of May. The earliest arrival at Dorset Harbour in 1929 was on April 6. No females were noticed until about mid-May, after which their numbers grew rapidly until the maximum population was well established by early June. Upon our arrival at Camp Kungovik on May 24, many had already become established on the few low, granite ridges, though they were not as numerous as along the south coast a week before. By June 3, however, swarms were frequenting the bare tops of the ridges and the snow-free strips of tundra, yet the maximum number was not reached until after June 8. Sporadic half-singing commenced on June 9, but full, rapturous outbursts were not general until June 20.

Collectively, the birds were mated early in June, with nest building under way by the third week of the month. On June 28, several nests were found with from one to three eggs, and the first full sets early in July. These varied in number from four to seven, many of which were still fresh as late as July 6. At the same time, other sets were considerably incubated at this date, and some of the birds were observed engaged in building nests even as late as July 2. There is thus a wide individual range in the date of egg-laying, as well as considerable discrepancy, apparently, in this general time, according to season and locality. Thus the first eggs were observed at Nettilling Lake (1925) on June 16, and full sets by June 20, whereas, as stated above, full sets were not noted at Camp Kungovik, in 1929, until the early days of July.

Nests are invariably secreted under boulders or in crevices among rocks. The first nestlings were seen on July 12, and several newly hatched broods the following day. The period of incubation appears to be from twelve to fourteen days. Both sexes bear food to the young. The male ceases singing shortly after the eggs are hatched and the care of the young begins, though occasional outbursts may be heard for a time, reminiscent of the love lyrics of June. The first young awing were noted at Cape Alberta on July 27, and a week thereafter they were common throughout the country to the westward.

In the Amadjuak-Lake Harbour region the species is everywhere generously dispersed along the coasts, on rocky islands, and in the interior. In 1930, the last individual of the season was observed on October 26. The following spring the earliest was recorded on April 5; the birds did not become common, however, until June 7.

No situation, apparently, is too barren or desolate for the Snow Bunting, for it is found universally distributed except on extensive, marshy lowlands and lofty heights of the eastern mountains that are covered by perpetual fields of ice and snow. Nesting habits require rocky terrain, so where this is lacking, as in the western grass plains, the birds are absent except during migration. In Baffin Island it has never been ascertained to what altitudes the Snow Buntings nest in true mountain tracts, but in the eastern region where ranges rise to heights of 5,000 feet or more, there are many slopes of southern exposure apparently suited to them up to 2,000 feet. In late summer and early fall, the writer has found the birds commonly occupying such slopes up to 2,500 feet, with scattered individuals at considerably greater elevations.

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Winnipeg
Manitoba
Canada

TWENTY-FIRST SUPPLEMENT TO THE AMERICAN ORNITHOLOGISTS' UNION CHECK-LIST OF NORTH AMERICAN BIRDS[1]

WORK on the final manuscript for the next edition of the A. O. U. Check-List is in progress, but in view of the extensive revision necessary it will be some time before it is in form for publication. In the meantime, the Council of the Union at a meeting held in Cambridge, Mass., in October, 1945, instructed the Committee on Classification and Nomenclature to prepare another supplement for publication in The Auk.

The list that follows covers cases to the end of 1945 so far as these have come to attention and have been decided. It it notably shorter than its two immediate predecessors.

As a further matter, the question of the Fossil List that has appeared at the end of the four editions of the Check-List to date has been given careful consideration as to its form and inclusion. There has been considerable review of the older fossil records in recent years so that understanding of them is far more authoritative than in 1931. The fossil list has been brought down to date, and will be included in the next volume in the same form in which it appears in the Fourth Edition.

Committee
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- FREDERICK C. LINCOLN
- ALDEN H. MILLER
- JAMES L. PETERS
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14 *Oceanodroma leucorhoa chapmani* Berlepsch. SAN BENITO PETREL. [106b.] *Oceanodroma monorhis chapmani* Berlepsch, Auk, vol. 23, no. 2, April, 1906, p. 185. (San Benito Island, Baja California.) Additional subspecies. Breeds on the San Benito Islands, Baja California. See van Rossem, Proc. Biol. Soc. Washington, vol. 55, May 12, 1942, pp. 10–11.

14 *Oceanodroma leucorhoa kaedingi* Anthony, becomes *Oceanodroma leucorhoa socorroensis* Townsend. *Oceanodroma socorroensis* Townsend, Proc. U. S. Nat. Mus., vol. 13, September 9, 1890, p. 134. (At sea near Socorro Island, México.) Breeds on Guadalupe Island, Baja California.

15 *Oceanodroma socorroensis* Townsend of the A. O. U. Check-List, 4th ed., 1931, in part becomes *Oceanodroma leucorhoa willetti* van Rossem, Proc. Biol. Soc.

[1] The Twentieth Supplement was published in The Auk, vol. 62, no. 3, July, 1945, pp. 436–449.

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Washington, vol. 55, May 12, 1942, p. 10. (Little Middle Island, Los Coronados Islands, Baja California.) Breeds on Los Coronados Islands, Baja California.

16 *Oceanites oceanicus* becomes *Oceanites oceanicus oceanicus* because of recognition of additional subspecies.

16 *Oceanites oceanicus chilensis* Murphy. FUEGIAN PETREL. [109a.] *Oceanites oceanicus chilensis* Murphy, Oceanic Birds of South America, vol. 2, 1936, p. 754. (Wollaston Island, Fuegia, Chile.) Additional subspecies. Breeds on islands near Cape Horn, ranging north to central Perú, casually farther; two recorded on coast of California. See Grinnell and Miller, Pac. Coast Avif., no. 27, 1944, p. 49.

19 *Pelecanus occidentalis occidentalis* Linnaeus. WEST INDIAN BROWN PELICAN. [126a.] *Pelecanus Onocrot[alus] occidentalis* Linnaeus, Syst. Nat., ed. 12, vol. 1, 1766, p. 215. (Jamaica.) Additional subspecies. Breeds from Jamaica to the Lesser Antilles; one record at Pensacola, Florida. See Wetmore, Auk, vol. 62, no. 4, October, 1945, pp. 578–579.

45 Genus *Chaulelasmus* included in *Anas*. See Delacour and Mayr, Wilson Bull., vol. 57, March, 1945, pp. 17, 21, 39 and 42. The single species becomes *Anas strepera* Linnaeus.

50 Subfamily *Nyrocinae* becomes Subfamily *Aythyinae* through change in name of the genus *Nyroca* to *Aythya*. See Twentieth Supplement to A. O. U. Check-List, Auk, vol. 62, no. 3, July, 1945, p. 438.

56 *Somateria mollissima sedentaria* Snyder. HUDSON BAY EIDER. [160a.] *Somateria mollissima sedentaria* Snyder, Occ. Pap. Roy. Ontario Mus. Zool., no. 6, May 5, 1941, p. 3. (Churchill, Manitoba, on Hudson Bay.) Additional subspecies. Hudson Bay from Cape Fullerton south into James Bay.

61 *Cathartes aura aura* Linnaeus. MEXICAN TURKEY VULTURE. [325b.] *Vultur aura* Linnaeus, Syst. Nat., ed. 10, vol. 1, 1758, p. 86. (Veracruz, México.) Additional subspecies. Panamá to Cuba and México, north to southern Florida and Texas. See Brandt, Auk, vol. 53, no. 3, July, 1936, p. 325; Van Tyne and Sutton, Misc. Publ. Mus. Zool. Univ. Michigan, no. 37, 1937, p. 16; Burleigh, Auk, vol. 55, July, 1938, pp. 520–521.

76 *Falco aesalon aesalon* becomes *Falco columbarius aesalon*. See Peters, Check-list Birds of the World, vol. 1, 1931, p. 295.

98 *Laterallus jamaicensis stoddardi* becomes *Laterallus jamaicensis pygmaeus* (Blackwall), from *Crex pygmaea* Blackwall, Edinburgh Journ. Sci., n.s., vol. 6, October, 1832, p. 77. (Philadelphia, Pennsylvania.) See Hellmayr and Conover, Cat. Birds Amer., pt. 1, no. 1, 1942, pp. 368–369.

118–119 Genus *Arquatella* included in *Erolia*. See Peters, Check-list Birds of the World. vol. 2, 1934, p. 285. The forms will stand as follows:

Erolia maritima (Brünnich).
Erolia ptilocnemis ptilocnemis (Coues).
Erolia ptilocnemis couesi (Ridgway).
Erolia ptilocnemis tschuktschorum (Portenko).
Erolia ptilocnemis quarta Hartert.

121 *Erolia testacea* becomes *Erolia ferruginea* (Pontoppidan), from *Tringa Ferrugineus* Pontoppidan, Danske Atlas, vol. 1, 1763, p. 624. (Iceland and Christiansöe.) Type locality from Brünnich, Orn. Bor., 1764, p. 54. (As

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Pontoppidan used initial capitals for all of his species names, the spelling with a capital in the original citation has no significance.)

121 *Erolia alpina sakhalina* (Vieillot) becomes *Erolia alpina pacifica* (Coues), from *Pelidna pacifica* Coues, Proc. Acad. Nat. Sci. Philadelphia, vol. 11, 1861, p. 189. (West coast of North America = Simiahmoo, Washington.) See Conover, Condor, vol. 47, no. 5, Sept. 29, 1915, p. 214.

146 *Cepphus columba kaiurka* Portenko. COMMANDER ISLANDS GUILLEMOT. [29a.] *Cepphus columba kaiurka* Portenko, Mitt. Zool. Mus. Berlin, vol. 22, pt. 2, October 30, 1937, p. 228. (Copper Island, Commander Islands.) Additional subspecies. Commander Islands and the western Aleutian Islands.

147 *Endomychura* restored as a valid genus. See Storer, Condor, vol. 47, 1945, pp. 154–160, figs. 27–29.

153 *Columba livia livia* becomes *Columba livia* in so far as the feral domestic pigeon of the Check-List is concerned. The stock now established at freedom within our limits shows variation in color covering the characters of several of the wild forms of the species, either through variation under domestication, or through mixing of races in the imported stock. It does not seem practicable, therefore, to list the bird covered in the Check-List under a subspecific name.

162–164 The following corrections due to typographical errors are necessary in numbers assigned to three additional subspecies of screech owls in Supplement Nineteen.

Otus asio swenki Oberholser. NEBRASKA SCREECH OWL. [373n.]

Otus asio inyoensis Grinnel. SOUTHERN CALIFORNIA SCREECH OWL. [373o.]

Otus asio cardonensis Huey. BANCROFT'S SCREECH OWL. [373p.]

174 *Phalaenoptilus nuttalli* and its races become *Phalaenoptilus nuttallii* to conform with the original spelling.

183 *Amazilia salvini* is dropped from the list as it is considered a hybrid, *Amazilia violiceps conjuncta* × *Cynanthus latirostris*. See Griscom, Bull. Mus. Comp. Zoöl., vol. 75, 1934, p. 378.

183 *Hylocharis xantusi* becomes *Hylocharis xantusii* to conform with the original spelling.

190 *Centurus carolinus* becomes *Centurus carolinus carolinus* through recognition of additional subspecies.

222 *Cyanocitta stelleri diademata* of the geographic area of the Check-List becomes *Cyanocitta stelleri macrolopha* Baird, from *Cyanocitta macrolopha* Baird, Proc. Acad. Nat. Sci. Philadelphia, vol. 7, June, 1854, p. 118. (100 miles west of Albuquerque, New Mexico.) See van Rossem, Bull. Mus. Comp. Zoöl., vol. 77, 1934, p. 453.

224 *Aphelocoma coerulescens nevadae* Pitelka. GREAT BASIN JAY. [481f.] *Aphelocoma coerulescens nevadae* Pitelka, Condor, vol. 47, February 10, 1945, p. 24. (3 miles east of Jackass Springs, 6200 feet elevation, Panamint Mountains, Inyo County, California.) Additional subspecies. Great Basin and Arizona.

229 *Parus atricapillus fortuitus* (Dawson and Bowles). COLUMBIAN BLACK-CAPPED CHICKADEE. [735g.] *Penthestes atricapillus fortuitus* Dawson and Bowles, Birds of Washington, vol. 1, 1909, p. 273. (Walla Walla, Washington.)

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Additional subspecies. Southeastern British Columbia to eastern Oregon, central Idaho and western Montana. See Duvall, Auk, vol. 62, 1945, p. 61.

256 *Psaltriparus minimus cecaumenorum* Thayer and Bangs. ASHY BUSH-TIT. [743d.] *Psaltriparus plumbeus cecaumenorum* Thayer and Bangs, Proc. Biol. Soc. Washington, vol. 19, February 26, 1906, p. 20. (La Chumata Mine, Sierra de San Antonio, 4500 feet elevation, Sonora.) Additional subspecies. Northwestern Sonora north to the Pajaritos Mountains on the Arizona boundary. See van Rossem, Occ. Pap. Mus. Zool. Louisiana State Univ., no. 21, 1945, p. 180.

237 *Sitta carolinensis carolinensis* becomes *Sitta carolinensis cookei* Oberholser, from *Sitta carolinensis cookei* Oberholser, Auk, vol. 34, April, 1917, p. 185. (Washington, D. C.) See Aldrich, Auk, vol. 61, no. 4, October, 1944, pp. 600–602.

237 *Sitta carolinensis atkinsi* becomes *Sitta carolinensis carolinensis*. See Aldrich, Auk, vol. 61, no. 4, October, 1944, pp. 601–602.

241 *Chamaea fasciata intermedia* Grinnell. INTERMEDIATE WREN-TIT. [742e.] *Chamaea fasciata intermedia* Grinnell, Condor, vol. 2, no. 4, July 14, 1900, p. 86. (Palo Alto, Santa Clara County, California.) Additional subspecies. San Francisco Bay region, California, except coastal strip from Golden Gate northward. See Grinnell and Miller, Pac. Coast Avif., no. 27, 1944, p. 327.

243–244 The following corrections, due to typographical errors, are necessary in numbers assigned to additional subspecies in Supplement Twenty.

Troglodytes troglodytes stevensoni (Oberholser). STEVENSON'S WINTER WREN. [722h.]

Thryomanes bewickii altus Aldrich. Appalachian Bewick's Wren. [719m.]

270 *Bombycilla garrulus garrulus* (Linnaeus). WAXWING. [618a.] *Lanius Garrulus* Linnaeus, Syst. Nat., ed. 10, pt. 1, 1758, p. 95. (Sweden.) Additional subspecies. Norway to northern Siberia, south irregularly in winter to France, northern Italy, southern Russia, Asia Minor and northern Iran. Casual at Cape Tobin, Liverpool Land, near outlet of Scoresby Sound, East Greenland. See Salomonsen, Medd. om Grønland, vol. 93, no. 6, 1935, p. 5.

270 *Bombycilla garrula pallidiceps* becomes *Bombycilla garrulus pallidiceps*. As shown above, Linnaeus in describing this species called it *Lanius Garrulus*, spelling the first letter of the specific name with a capital to indicate that the word was used as a noun and not as an adjective. The suffix therefor does not change should this name be placed subsequently with a generic term having a different gender.

306 *Icterus cucullatus nelsoni* Ridgway. ARIZONA HOODED ORIOLE. [505a.] Restored to the list, for birds from southeastern California and southwestern Utah to southwestern New Mexico. See van Rossem, Occ. Pap. Mus. Zool. Louisiana State Univ., no. 21, 1945, pp. 242–243.

306 *Icterus cucullatus californicus* (Lesson), recognized in the Nineteenth Supplement, Auk, vol. 61, July, 1944, pp. 459–460, is restricted to birds from southern California to northwestern Baja California, with the name CALIFORNIA HOODED ORIOLE. [505c.]

307 *Icterus bullockii* becomes *Icterus bullockii bullockii* because of division into two subspecies.

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307 *Icterus bullockii parvus* van Rossem. RIDGWAY'S ORIOLE. [508a.] *Icterus bullockii parvus* van Rossem, Occ. Pap. Mus. Zool. Louisiana State Univ., no. 21, October 25, 1945, p. 237. (Jacumba, San Diego County, California.) Additional subspecies. San Francisco Bay region to northern Baja California, in migration to Arizona and southern Sonora.

311 *Piranga flava dextra* Bangs. EASTERN HEPATIC TANAGER. [609a.] *Piranga hepatica dextra* Bangs, Proc. Biol. Soc. Washington, vol. 20, March 27, 1907, p. 30. (Jalapa, Veracruz.) Additional subspecies. Southwestern New Mexico and western Texas through eastern Mexico to Guatemala. See Sutton and Phillips, Condor, vol. 44, 1942, pp. 277–279.

314 *Hedymeles* becomes a subgenus of *Pheucticus* Reichenbach, which, therefore, is added to the Check-List. *Pheucticus* Reichenbach, Av. Syst. Nat., June 1, 1850, pl. 78. Type, by subsequent designation (Gray, 1855), *Pitylus aureoventris* Lafresnaye and d'Orbigny. See van Rossem, Occ. Pap. Mus. Zool. Louisiana State Univ., no. 21, 1945, p. 254.

The forms will stand as follows:

Pheucticus ludovicianus (Linnaeus).
Pheucticus melanocephalus melanocephalus (Swainson).
Pheucticus melanocephalus maculatus (Audubon).

356 *Melospiza lincolnii alticola* (Miller and McCabe). MONTANE LINCOLN'S SPARROW. [583b.] *Passerella lincolnii alticola* A. H. Miller and T. T. McCabe, Condor, vol. 37, no. 3, May 15, 1935, p. 156. (Bluff Lake, 7400 feet elevation, San Bernardino Mountains, San Bernardino County, California.) Additional subspecies. Breeds in mountain areas from southwestern Montana, central Idaho and southwestern Oregon to southern California, central Arizona and northern New Mexico; in winter to México and Guatemala.

GENERAL NOTES

The name of the White-faced Titmouse of the Philippines.—C. E. Hellmayr, in his 'Kritische Bemerkungen über die Paridae, Sittidae, und Certhiidae' (Jour. für Orn., 49: 170–172, April, 1901), proposed the generic name *Penthornis* (type, *Melaniparus semilarvatus*), and applied to what he considered a second species the specific name *luzoniensis* Gmelin, after Sonnerat's figure. Later on ('Genera Avium, Paridae,' Brussels, 1911) he used the older name *tessacourbe* Scopoli, based on the same plate.

In his 'Manual of Philippine Birds,' Manila, 1909, pp. 108–109, Richard C. Mc Gregor had already applied to the White-faced Titmouse of Mindanao the name of *Penthornis tessacourbe*. In our 'Notes on the Taxonomy of the Birds of the Philippines' [Zoologica, 30 (3): 114, November 15, 1945], we have shown that *Penthornis* is a synonym of *Parus*, and that the species *tessacourbe* is very closely related to *Parus varius*.

I now find that the name *tessacourbe* is not applicable to the species, and that the proper name is *Parus semilarvatus* (Salvadori, Atti Soc. Ital. Sci. Nat., 8: 375, 1865), with two subspecies: *semilarvatus* from Luzon, and *nehrkorni* (Blasius, Jour. für Orn., 38: 147, 1890), from Mindanao.

In his manual, McGregor writes:

"*Muscicapa tessacourbe* Scopoli, and *M. luzoniensis* Gmelin were both based upon Sonnerat's plate. The species was unrecognized until Platen collected a male in Mindanao. Blasius described this specimen under the name *Micropus nehrkorni*, suggesting the probability that it was the same as *Muscicapa luzoniensis*. Sonnerat's figure does not look much like a *Penthornis*."

If we now turn to Sonnerat's figure and description of the bird ['Voyage à la Nouvelle-Guinée': 59, pl. 27, 1776 (Paris)] we find that the text reads as follows:

"La quatrième espèce de Gobe-mouche noir, est un peu plus gros que les précédents; il est aussi d'une forme plus courte et plus ramassée; on le trouve à Madagascar, ainsi qu'aux Philippines; la tête, la gorge, le col en arrière, le dos, les ailes et la queue, sont d'un noir changeant en violet; la poitrine, le ventre et les côtes sont d'un gris noirâtre; il y a sur chaque aile, dans son milieu, une tache blanche; le bec et les pieds sont noirs; l'iris tire sur le brun."

It is obvious that this does not fit in at all with the characteristics of the White-faced Titmouse. As to the figure, it does not correspond to any known bird. It has very long rictal bristles, like a true flycatcher, a long, thin curved bill, and gray breast, abdomen and rump, contrasting with the black throat and upper parts. The white patch on the wing is large and situated on the lesser wing-coverts, while in the Titmouse it is restricted to the base of the primaries and outer secondaries.

That the name in any case cannot be applied to a Philippine bird, in spite of the general heading "Gobbes-mouche de l'Isle de Luçon" three plates representing five birds, and the previous mention that he had seen there no fewer than five "Gobbes-mouches," is evident from Sonnerat's text, giving Madagascar as the principal locality and the Philippines as a secondary one only, the emphasis being laid on the fact that the name "tessacourbe" was used for the bird by the natives of the former island. The only black Madagascar species to which it might possibly be applied is *Copsychus alboscapularis*, but this bird has no long rictal bristles, and although its lower belly is sometimes mottled with white or brown it cannot be said to possess a gray breast and abdomen!

It appears therefore that *Muscicapa tessacourbe* should be considered as unidentifiable.—Jean Delacour, *American Museum of Natural History, New York 24, N. Y.*

The Red-spotted Bluethroats of northwestern Alaska.—Recently, through the coöperation of the Colorado Museum of Natural History, the Museum of Vertebrate Zoology, the Chicago Natural History Museum (Bishop coll.), and the Chicago Academy of Sciences I have been able to study a more comprehensive series of Alaskan bluethroats than has been the good fortune of earlier investigators. The birds forwarded by these institutions, when added to the material already in the combined collection of the Fish and Wildlife Service and the U. S. National Museum, included 16 Alaskan examples, while for comparative material I have had good series from northern Europe, China and Siberia, and wintering birds from northeastern Asia. Lack of material of a number of European and Asiatic races precluded a revision of the species, but the problem of immediate interest—the status of the North American birds—was examined and the following result obtained. In neither size nor color characters is it possible to distinguish Alaskan or, for that matter, northeastern Siberian, birds from typical *suecica* of Scandinavia. It follows therefore that *robusta* cannot be recognized and that the Alaskan birds should be called *Luscinia* (or *Cyanosylvia*) *suecica suecica*. This race apparently ranges across northern Europe and Asia, north of the other subspecies, to northwestern Alaska.

The race *robusta* was described as being darker, more intensively colored, with a larger reddish area on the forehead, and larger (wing 75–80 mm.) than the nominate form.

The wing length of eight Alaskan males varies from 70.1 to 74.1 mm.; that of 12 typical *suecica* from Europe and Asia 69–74 mm.; the tails of the eight Alaskan examples, 49.2–55.2 mm; of 12 Eurasian birds 53–59 mm. Eight Alaskan females have wings of 68.1–71 mm. as compared with 65–74 mm. in European and Asiatic examples.

While convinced that the material examined leaves me no choice but to conclude that *robusta* is not separable from *suecica*, I am not unmindful of the fact that European ornithologists, and especially the Russians who have far better Eurasian material available, do recognize *robusta* as a valid form. No actual topotypes of *robusta* have been available to me in this study.—HERBERT FRIEDMANN, *U. S. National Museum, Washington, D. C.*

The Range of *Francolinus finschi* extended northward.—Although described by Bocage as long ago as 1881 from a single immature male collected at Caconda in Angola, this francolin has remained a rarity; and very little has been published about its distribution or behavior. Mackworth-Praed (Ibis: 122, 1922) regarded it as a valid species, probably allied to *Francolinus levaillantii*, and represented by two specimens at Tring. One of these was an adult male from South Libollo, Angola, obtained by Pemberton. The other bird, however, a young female taken by Ansorge at Katenge in Benguela Province, is really not *finschi*, but the young of *F. hartlaubi*.

More recently Rudyerd Boulton tells me that he collected two females of *finschi* at Namba in the Mombolo area of Angola in 1931 for the Carnegie Museum, and that Mrs. J. Bodaly sent one to Boardman Conover from Chitau, Angola, in 1932. In the British Museum, Boulton has also seen one adult with well-developed spurs from between the Cuanza and Luando rivers, collected by E. H. Buxton.

Those appear to have been all that were known until Dr. R. Malbrant of Brazzaville published a note on a "yellow-footed francolin" from the vicinity of Stanley Pool on the Congo River, in the Bulletin de la Société de Botanique et de Zoologie Congolaises, Léopoldville: 3 (4), 6, 1940. Dr. Malbrant subsequently sent three skins of this bird to the American Museum of Natural History, and they prove to be

WEBB.—ROBINS' NESTS ON TREE BRANCHES OVERHANGING ROADS. (Photographs by H. L. Standley.)

finschi. The range has thus been extended some 660 miles to the northward, into an area where the bird was certainly most unexpected.

Careful comparison of two adult males and an adult female from the vicinity of Brazzaville with the male in the Rothschild Collection from the South Libollo country fails to reveal any difference which I can regard even as subspecific. The female scarcely differs from the males in color or size, except that her tarsus is about 3 mm. shorter and lacks a spur. The wing-length of Brazzaville males is 170 and 181 mm.; that of the female, 173.

If *finschi* is to be regarded as a race of some earlier-known species, I believe that it must be allied with *Francolinus shelleyi*, and not *levaillantii*. The latter species is represented in Angola by two races, and *F. levaillantii benguellensis* has been collected by Boulton in the Mombolo area, where he also found *finschi*. In general form *finschi* is very similar to the large-billed *F. s. shelleyi*, but differs strikingly in the lack of any black lines encircling the light throat or running from behind the eye down the side of the neck. It is also without black barring on the middle of the under surface. Yet there is fine gray barring on the outer webs of the flank-feathers which suggests alliance with *shelleyi*. When we notice how the black lines around throat and neck have broken up in *F. shelleyi whytei* of Nyasaland and the southeastern Congo to a merely speckled condition, it seems not unlikely that *finschi* may exhibit a still greater divergence from the nominate race. As for the black barring of median under parts in *F. s. shelleyi*, this has been diluted to brown or rufous-brown barring in *F. shelleyi elgonensis* of Kenya Colony, and thus may have been lost by *finschi*.

Doctor Malbrant wrote in 1940 that this "yellow-footed francolin" is widely distributed in the region of Stanley Pool, though less numerous there than *Pternistis afer cranchii*. It frequents grassy savannas, and is very difficult to hunt without dogs. When pursued it may seek refuge near wooded spots, but unless wounded it will not really enter the woods. This brief account of its habits agrees well with what we know of *F. shelleyi whytei* in the Upper Katanga.—James P. Chapin, *American Museum of Natural History, New York 24, N. Y.*

Robins' nests on tree branches overhanging roads (Plate 10).—A proclivity of Robins to build nests on branches of trees overhanging the streets has been noticed for some years in Colorado Springs. An opportunity came last fall and winter to take a census of such nests. A gentle chinook had hastened the falling of leaves. In general, in this city, Robins prefer to nest in spruce trees, so plentiful in certain sections. Then Robins' nests are not often seen on other trees. Maples, ash, box elders, some cottonwoods and elms are the principal trees bordering our streets and in park areas. Here and in other Colorado towns, Robins seem to avoid building nests on cottonwood trees.

Coasting at 10 M. P. H. or less, up and down, in different directions and in different lights, I made a count of over 500 Robins' nests. The tabulated result shows that 345 were noted on tree branches overhanging streets, alleys and driveways, 107 on branches bending inwards over sidewalks, and 54 in vertical forks. Many of the latter branches inclined to the streets when other vertical forks could have been selected. These nests are quite conspicuous although those built squat on heavy limbs are sometimes overlooked. Great attention was given to noting nests on inside tree branches in order to arrive at a careful count. Lower branches from fifteen to thirty feet above the streets are usually selected by the birds. In the foothill region, west of the city, roads have been cut through scrub oak patches, and where these grow on high banks, nests have been noted on branches inclining over the roads.

The locations observed seem to have nothing to do with the sun. Nests have been seen in spruce trees close against the north side of my house where few sun's rays reach. Innocently encouraging this research, a Robin built her nest on the lower limb of a spruce tree which overhung the driveway to my garage. Numerous nests have been seen over streets where the traffic is heaviest, so evidently Robins are little disturbed by this.

Forbush, in his excellent work, 'Birds of Massachusetts and other New England States,' 3: 412, 1929, wrote: "Many robins' nests are built in trees along river banks on branches overhanging the water." Vaughans of Chicago, in an advertisement of Robin roosts, state: "Robins will not occupy a nesting box but insist on a covered, sheltered shelf which allows them to see on at least three sides."

Not content with being able to see up and down one street, a surprising number of Robins selected branches overhanging the corners of cross streets. Unfortunately, I did not keep an exact count of them.—GERALD B. WEBB, *Colorado Springs, Colorado.*

An unusual nest of the House Wren.—On July 8, 1945, while visiting my son at Camp Carson, near Fredricksburg, Lebanon Co., Pennsylvania, my attention was called to an unusual nest of the Eastern House Wren (*Troglodytes aedon aedon*). Attached to the outside wall of a wooden cabin about twelve feet above the ground, and supported only by a glass electric insulator, was a well preserved Robin nest, upon which was superimposed a second Robin nest. A wren had constructed a nest on top of the upper nest, as was evidenced by an accumulation of twigs measuring about eight inches wide by six inches deep. No entrance hole was visible from the ground, but I was informed that a pair of wrens had occupied the nest a short time previous to my visit. House Wrens are fairly common at the camp, but strangely enough no bird boxes are in evidence. This, together with the fact that the tree growth of the vicinity is rather scrubby, with a probable minimum of natural cavities, might be the reason for this particular 'outdoor' nest—the first I have observed.—JOHN A. GILLESPIE, *Glenolden, Penna.*

Nesting of Gadwall and Shoveller on the Middle Atlantic Coast.—Waterfowl habits have received the attention of sportsmen and ornithologists for a great many years and as a result of numerous observations, field studies and banding work, waterfowl ranges have been well delineated. However, some breeding ranges as set forth in ornithological literature, while based on the reliable and careful work of capable naturalists, may be subject to extension, perhaps because of conditions causing waterfowl to change their habits. Some modifications in wintering, migrational and breeding ranges of waterfowl can be attributed to protection and the development and maintenance of favorable habitat. This point is well illustrated in the nesting of the Gadwall and Shoveller on two national wildlife refuges located on the Atlantic Coast.

The American breeding range of the Gadwall (*Chaulelasmus streperus*) according to the A. O. U. Check-List (4th ed.) is " . . . from Little Slave Lake, Lake Athabaska, and Hudson Bay (northern Manitoba) to central British Columbia, interior Washington, Oregon, California, Utah, southern Colorado, northwestern New Mexico, southwestern Kansas, northern Iowa, southern Wisconsin, central Minnesota, and Ohio (formerly)." The Gadwall has nested on the salt marshes of the Bombay Hook National Wildlife Refuge, Kent County, Delaware, in numbers sufficient to remove its breeding there from the accidental category. Gadwalls also nest each year on the Pea Island Refuge, Dare County, North Carolina. These two refuges embrace a variety of marsh and aquatic habitats, including salt, brackish and fresh water con-

ditions. The species usually nests on the salt marshes on the Bombay Hook Refuge and at the Pea Island Refuge, along the edge of an impound on the inner margin of the salt marsh. It was noted, however, that during the 1941 nesting season several broods were reared on Raymond's Pool of the Bombay Hook Refuge, an impound on the edge of the salt marsh which is maintained, in part, by a small flow of fresh water.

The following records of nesting by the Gadwall on the Bombay Hook Refuge testify as to the regularity of breeding on this area. The observations are those of John Herholdt, former refuge manager, with the exception of 1945 when George Spinner was in charge.

1938 A pair spent the summer on the refuge and was seen daily to July 26; apparently did not nest.
1939 Female and seven young about three days old seen June 24. Brood last seen July 2 when six young remained.
1940 Pair again seen but no nest was found. Solitary male seen daily during summer accompanied by female at evening.
1941 Nine mated pairs seen regularly during nesting season; six broods produced on Raymond's Pool.
1942 Species showed good increase during spring flight and 30 mated pairs seen at peak, April 8. Eight broods totaling 40 young counted during season.
1943 Based on young birds observed, it was estimated at least 20 were produced on the refuge.
1944 Military use of part of refuge precluded field studies.
1945 Four broods seen; approximately 20 young produced on refuge marshes.

Breeding records of the Gadwall on the Pea Island Refuge listed below are from observations reported to the Service by Sam A. Walker, former refuge manager except in 1945 when William Hills was in charge of the refuge.

1939 Female and brood of ten seen June 12 when the young were about four days old. One young was banded. (Auk, 58: 106, Jan., 1941.)
1940 At least six broods seen during season. Nest with eggs seen June 6. First young noted June 24. Brood of 14 seen. (Bird Lore, 42: 383, July–Aug., 1940.)
1941 Nest found June 13. Five broods seen during season.
1942 Three broods seen.
1943 Eight broods found; estimated 60 young produced on refuge this season.
1944 Eight broods counted. Fifty young estimated produced.
1945 Twelve broods seen; at least 60 young produced.

The repeated nesting of the Gadwall on these Atlantic Coast areas raises the question of whether the species may not also be nesting in numbers in suitable habitats at intermediate points between these areas and the principal breeding range. The Gadwall is generally considered to be a fresh-water duck, breeding far in the interior, building its nest on dry ground and "never near to water" (Kortright, 'Ducks, Geese and Swans of North America,' 1942).

The Shoveller (*Spatula clypeata*), according to the A. O. U. Check-List (4th ed.), formerly nested occasionally to western New York, Indiana and Illinois on the eastern edge of its breeding range. As with the Gadwall, the nesting of the Shoveller on the salt marshes of the Bombay Hook Refuge has been too regular in the past several years to be considered accidental.

The following records of the nesting of this duck on the Bombay Hook Refuge as reported by Mr. Herholdt are presented:

1937 Eight broods found on Raymond's Pool, June 21, aggregating 33 young.
1938 Eighteen nests found on the Salt Marsh during nesting study. An estimated 50 young matured this season.
1939 Total of 31 nests found during nesting study. Nest hatching May 30. In early September, 74 young found in three flocks.
1940 Located 44 nests. Increase in numbers of spring migrants noted.
1941 Considered third most abundant nesting duck this year. Ran close second to nesting Black Duck, 30 mated pairs present May 9. Two hundred adults and young counted July 30.
1942 Approximately 250 young produced this season. Later records incomplete due to military activities on part of the refuge.

Studies conducted on Bombay Hook Refuge in 1938 showed that the Shoveller built its nest on the salt marsh, mostly in patches of dead *Spartina patens*, the live and dead stems of which constituted the protective covering. All nests were in close proximity to tidal guts with the exception of one which was approximately 30 yards from Delaware Bay. The other nests ranged from 12 to 200 yards from the channels intersecting the salt marsh. Ornithologists generally refer to the Shoveller as "essentially a fresh-water duck," taking to salt water only when forced to do so. Apparently, the nesting of Shovellers on salt marshes of the Atlantic Coast has not been reported heretofore.

The nesting of the Gadwall and Shoveller on the salt marshes of the Middle Atlantic Coast may not be conventional, though it is of significance from the standpoint of local production and suggests the possibility of promoting more extensive breeding of waterfowl on the coastal marshes.—R. E. Griffith, *Fish and Wildlife Service, Chicago 54, Illinois.*

Rare egg-laying date for the Canada Goose.—Egg-laying time for the Canada Goose (*Branta c. canadensis*) varies considerably with both altitude and latitude, but it is generally conceded to occur in any given section of the country soon after the arrival of spring there. Judging from the records of the U. S. Fish and Wildlife Service, any departure from this early spring egg laying of wild honkers would be not only interesting but a scientific oddity as well. Therefore, it seems desirable to record an instance of a goose having an egg in November. The rare record was brought to light by Dr. Carleton Vaughn, Washington, D. C. sportsman, who passed the information on to the Fish and Wildlife Service. While hunting the Sassafras River on Maryland's eastern shore, November 3, 1945, Dr. Vaughn had succeeded in bagging two fine honkers. Later, when the birds were being dressed, an egg, fully developed and apparently about to be laid, was found in one of the geese. No explanation of the November egg can be presented on the basis of known breeding habits in wild honkers. It can be regarded only as a freak happening and a record which probably will stand for many years.—Cecil S. Williams, *Fish and Wildlife Service, Brigham, Utah.*

Red-eyed Vireo nesting in hemlock.—In a recent book (A Guide to Bird Watching: 102, 1943), Joseph J. Hickey, speaking of nesting-site requirements as being a factor in determining habitat selection by different species of birds, says: "A Red-eyed Vireo requires a small horizontally forked twig of a deciduous tree." Kendeigh, discussing much the same matter (Community Selection by Birds on the Helderberg

Plateau of New York, The Auk, 62: 423, July, 1945), commenting on the absence of Red-eyed Vireos from the hemlock environment, says: "There is no obvious reason why the Red-eyed Vireo should not also nest in hemlock, although it is not known to do so."

In view of the foregoing it would seem desirable to record the finding of a nest of the Red-eyed Vireo (*Vireo olivaceus*) by the writer in a hemlock tree about 40 feet high in the North Chagrin Reservation of the Cleveland Metropolitan Park System (about 16 miles east of the City of Cleveland, Ohio) July 6, 1936. The forest here is predominantly beech and sugar maple, with a few scattered hemlocks. The particular hemlock tree in which this nest was found was surrounded by beeches and maples, so that there were plenty of available nesting sites in deciduous trees close at hand. The nest was located about 15 feet above ground, suspended between twigs that made a horizontal fork near the end of a branch. It contained three eggs. The bird was incubating at the time, but remained near by during the climbing of the tree and examination of the nest. There was no doubt about identification. At the time the unusualness of the site was not appreciated or photographs would have been secured. —Arthur B. Williams, *Cleveland Museum of Natural History, Cleveland 15, Ohio.*

More concerning the thundering and clapping sounds of the Chimney Swift.—Through his article on the Chimney Swift, Groskin (Auk, 62: 361–372, 1945) stimulated discussions by Moore (Auk, 63: 70–72, 1946) and Allard (*ibid.*: 84) on the sound effects, especially the "rumbling of thunder" noises, of this bird in confined spaces. Earlier, Worth (Auk, 60: 558–564, 1943) discussed the clapping sound produced by perched Chimney Swifts. During two seasons the writer has studied the roosting and breeding populations of Chimney Swifts on the roofs of buildings on the campus of Kent State University, and he has had some experience with the thundering and clapping sounds of this species. Roosting birds, which congregate in air shafts during the spring and late summer and which are disturbed by the flashing of a light down into the ventilators, set up a thundering noise while flying down to a lower level. For example, on the evening of September 24, 1944, a small flock of swifts was discovered in an air shaft on Merrill Hall. A flashlight beam caused the birds to push off from the walls, and with a thundering sound they dropped several feet lower in the shaft. (Forty-four birds were removed from this ventilator, including ten previously banded individuals, six of which had nested that season on Kent Hall near by and four which probably had been raised there during the preceding months.) The shaft is 22 inches × 26 inches in cross section and 42 feet deep with a damper opening, making it an open pipe with a fundamental resonant frequency of 13, just within the range needed for perceptible overtone production (Moore, *loc. cit*). On the evening of May 19, 1945, a flock of 88 Chimney Swifts (including five returns, two of which were mates and have nested in the same shaft for at least two seasons, another nesting bird of the previous year, and two others which had probably hatched in the season of 1944) roosted in one of the 73 air shafts of Kent Hall. The disturbance caused by a light brought about a very loud thundering sound. Here the shaft is 21 inches square in cross section and 21.5 feet deep with a damper opening near the bottom. It has a fundamental resonant frequency of 26.

Worth (*loc. cit.*) believed that the characteristic clapping sound of the Chimney Swift was caused by striking the wings against the wall. All of the observations made by this writer indicate that the wings are slapped against the body in producing this sound which presumably is made to frighten away the intruder. When a light is focused on a swift (flashlight by night, mirror by day) clinging to its nest or to the wall, it pushes its body away from the nest or wall by straightening its legs to a hori-

zontal position, slowly raises its wings to a high angle, holds them still momentarily, and then claps them vigorously against the sides of the body. The bird may then remain in place and repeat the performance in a few seconds or drop down several feet where the process may be repeated if the disturbance continues. The mate usually follows suit or may perform simultaneously. Seldom will one swift clap more than twice in succession without an interval of rest. When incubating eggs or brooding young, the swifts usually require a longer period of irritation before giving the clapping reaction. Sometimes the birds will push off entirely from the nest or wall, clap their wings in rapid succession for several seconds while fluttering in the well, and then return to the same spot. Mates may alternate in doing this or perform at the same time. Worth apparently heard only the single-clap behavior and raised the question as to whether it may be incidental to changing position in the chimney. Having observed these phenomena for many nights in succession over a period of several months each year, the writer is convinced that they are deliberate behavior reactions which come to an end soon after the disturbance ceases.—RALPH W. DEXTER, *Kent State University, Kent, Ohio.*

Land birds at sea.—On October 11, 1945 I was returning to the United States aboard ship. Early in the afternoon I saw a Red-shafted Flicker land on the ship's rail. As the afternoon passed, two more flickers, a small owl of undetermined species, three White-throated Sparrows, and approximately fifty other small birds of undetermined species landed on various parts of the ship. When the first flicker landed on the ship, we were nearly five hundred miles due west of the southern California coast. With the exception of making short flights into the wind or to the other ship, the majority of the birds remained on the ship until we entered San Diego harbor two days later. During this same period I also observed several small birds floating in the water, and on one occasion saw a small bird picked from the water and swallowed by an albatross. A strong easterly wind, which frequently approached thirty miles an hour on October 9, 10, 11, and 12, may have accounted for the presence of such non-migratory species as the owl nearly five hundred miles from land.—JOHN L. BUCKLEY, *New York State College of Forestry, Syracuse, New York.*

Tree Swallow mortality from exposure during unseasonable weather.—The Tree Swallow, *Iridoprocne bicolor* (Vieillot), is said to be one of the hardiest of its family and often arrives early enough in the spring to encounter more or less snow and cold weather. The spring of 1945 was unusually cold and wet at the time the Tree Swallows were arriving and some, possibly many, birds contracted pneumonia and subsequently died. One birdhouse in the heart of Syracuse, N. Y., produced eleven dead Tree Swallows on May 15, all victims of pneumonia. By coincidence, the writer happened to be at the Huntington Forest, Newcomb, N. Y. (in the Adirondacks), on the above-mentioned date and found Herring Gull pellets on the gull nesting rocks in Wolf Lake that contained feathers, feet, bills and other parts of Tree Swallows. The inference in this case was that the swallows were not taken on the wing but rather in the water or its immediate environs, where they had dropped in a weakened condition and perhaps later died. Innumerable Tree Swallows were observed in the act of catching small insects above the surface of Wolf Lake and in so doing often came near the gulls. The gulls never showed any aggressiveness toward the swallows and that in itself undoubtedly accounts for their fearlessness. Herring Gulls are noted for their scavenging propensities and they undoubtedly were acting in that capacity at Wolf Lake rather than as predators.—WILFORD A. DENCE, *Roosevelt Wildlife Forest Experiment Station, N. Y. State College of Forestry, Syracuse, N. Y.*

Food of a Yellow-crowned Night Heron.—On May 6, 1943, I collected a set of six eggs of the Yellow-crowned Night Heron (*Nyctanassa violacea violacea*). The nest was on a horizontal branch of an oak tree in a small wood along Flatrock Creek southwest of Payne in Paulding County, Ohio. Five days later the birds were standing on another nest in the same wood. This nest appeared to be nearly completed. An unknown number of young were later reared in it. After the young had departed, I searched through the debris under the nest and secured a large number of otoliths of crayfish and a considerable number of elytra of the large scavenger water beetle (*Hydrophilus triangularis*) as well as one bone of a frog. These were sent to Dr. H. C. Oberholser of the Cleveland Museum, who identified the frog bone and verified my determinations of the elytra.

Late in May, 1944, I saw a Yellow-crown sitting on another nest in the same wood. Like the two previous nests it was about 45 feet above ground and well out on a horizontal branch of an oak. This nest was not approached until July 12 when five large young were observed standing on it. On that date three decomposed crayfish lay on the ground under the nest. The young were not disturbed. The leaves had fallen when I returned to search through the debris under the nest. A careful search produced 484 otoliths of crayfish and only one elytron of *Hydrophilus*. This represents at least 242 crayfish consumed by the five young and perhaps also by the adults. Since no remains of fish were observed during either year it seems unlikely that the herons consumed many of them.

Perhaps a careful study of the debris under Black-crowned Night Herons' nests would show that they, too, subsist largely on crayfish. I have heard fishermen at Indian Lake in Logan County, Ohio, refer to the Black-crowns as "Fish Hawks"—a name which I believe is neither appropriate nor deserved.—HOMER F. PRICE, *Payne, Ohio.*

Mallard nesting in tree cavity.—On May 10, 1944, at a large woodland pond south of Lake Loramie in Shelby County, Ohio, Ferd and Robert Brown secured the remains of a Mallard and a large fragment of an egg from a cavity of a willow stub standing in about two feet of water. The nesting cavity was about eight feet above ground. Many feathers were strewn about the entrance. I could not wade out to the nest because of knee-length boots and could not see the nest because of the dense growth of willows and buttonbush (*Cephalanthus*).

The Brown brothers stated that wild ducks had used this nesting site in previous years. They were of the opinion that the sitting bird had been killed on the nest by a mink. They insisted that a raccoon would not have done so. Mr. B. A. Magill, the experienced taxidermist of the fish hatchery at St. Marys, proved conclusively that the well-preserved wings were those of a common Mallard (*Anas platyrhynchos*). The egg fragment is so large that the short diameter can be measured. It measures 1.68 inches.—HOMER F. PRICE, *Payne, Ohio.*

Under-wing fishing of the Black Heron, *Melanophoyx ardesiaca* (Plate 11).—This small heron, common in many parts of Africa and Madagascar, has a very peculiar way of catching fish, which I think is unique in the family. It has long been recorded in Africa, particularly by T. Ayres, and more recently in Madagascar by A. L. Rand who writes as follows [The Distribution and Habits of Madagascar Birds, Bull. Amer. Mus. Nat. Hist., 77 (Art. 5): 331, 1936]:

"Near Marovoay, April 4, 1931, I had an opportunity to watch one of these birds feeding in the shallow water of a flooded rice field. It was shortly before dark and the bird was feeding actively. It would take a few rapid steps, apparently to over-

take prey it had sighted, then spread its wings, bringing them forward until they met, and with the tips of the quills in the water. The head was in the canopy formed by the wings and I could see the movements of the body as the bird apparently caught the fish bewildered by the darkness. Several times the bird raised its head from between its wings, ruffling its crest in so doing, to look about for possible danger, then ducked its head back into the shelter of its wings. Apparently it overtakes its prey and by making a canopy of its wings confuses them so that they are more easily caught. That its method was successful I found on collecting the bird and examining its stomach and gullet, which contained twelve fish from 15 to 30 mm. long."

Commandant Ph. Milon, now in Madagascar, where he spends his spare time bird watching and photographing, has just sent me the photographs here reproduced, which illustrate to perfection Rand's description of this remarkable habit of the Black Heron. These were taken on November 29, 1945, at Lake Anosy, Tananarive, in bright daylight. The birds appear to feed throughout the day.—J. DELACOUR, *American Museum of Natural History, New York 24, N. Y.*

White eggs of the Long-billed Marsh Wren.—In the course of ecological investigations in northern Ohio, in the summer of 1935, I visited a small marsh on the outer extremity of Bay Point, a large wave-formed sandspit which has appeared and disappeared and changed its position several times during the historical period of the Sandusky Bay area. Bay Point projects southward from the tip of the Marblehead Peninsula, appearing like a tooth on the upper jaw of Sandusky Bay, and is on its eastern flank, exposed to the full force of northeast storms which periodically, with great violence, sweep down Lake Erie. Bay Point has been established in its present position long enough for a number of large cottonwoods to have grown on it. At the time of my investigation there was on its outer extremity a small shallow pond, possibly two acres in extent, which changed from an open sheet of water almost without emergent vegetation in 1930 to a marsh of cattail and bulrushes with a few scattered buttonbushes in 1935.

On June 20, 1935, I examined the contents of several occupied nests of the Long-billed Marsh Wren (*Telmatodytes palustris*), some of which were sets of the normal brown-colored eggs and others were pure white or very faintly marked with a dark pattern. The following year this marsh wren colony was visited again, and again sets of white eggs were found. Unfortunately the numbers of sets were not recorded either year. Two of these sets were collected by Frank W. Braund, on May 13, 1936, one of which (containing six fresh eggs) is now in the collection of the Cleveland Museum of Natural History. This apparent partial segregation of a latent hereditary character in a small newly formed colony is suggestive of the relationship of this species to the North American race of the Short-billed Marsh Wren (*Cistothorus platensis*), which habitually lays white eggs.

The egg collection of the U. S. National Museum contains 107 sets of the various races of *Telmatodytes palustris*, four of which have white shells. One, taken by E. J. Brown on the Potomac Flats, District of Columbia, on June 6, 1891, is a set of five pure white eggs. Another, containing two eggs, one white and one brown, was collected by C. W. Richmond, at Alexandria, Virginia, on July 9, 1897. A third is a set of six in which one white egg with an obscure dark pattern stands out among five normal chocolate ones. This was taken by Walter F. Webb, in Cayuga County, New York, on May 31, 1891. Still another set of four pure white eggs was collected by L. B. Bishop near Hamden, Connecticut, on June 24, 1893. Dr. Bishop describes this discovery in 'The Auk,' 11: 81, 1894. In fact, he records the taking of three sets of white eggs in the Quinnipiack Marshes at Hamden, on June 24, July 11, and July

DELACOUR.—UNDER-WING FISHING OF THE BLACK HERON. (*Top*) BLACK HERONS AND FULVOUS TREE-DUCKS. (*Right*) BLACK HERON WADING. (*Left*) OPENING WINGS AT SIGHT OF FISH. (*Bottom*) UNDER-WING FISHING.

28, 1893. "The nests," said the author, "which are fairly typical of *C. palustris*, were not more than eight yards apart and probably belonged to the same bird." Dr. Bishop proceeded to theorize: "The white eggs of this species which have been recorded, taken in connection with the normally white eggs of its near ally, *C. stellaris*, and the frequently white eggs of the Bluebird (*Sialia sialis*) have to my mind a peculiar importance as an additional argument for the truth of the theory of protective coloration, the covering of the nest rendering the usual dark pigment unnecessary." Referring to this statement, a footnote by J. A. Allen, then editor of The Auk, criticizes Bishop's conclusions as follows: "Albinistic eggs are well known to occur more or less frequently in birds that normally lay colored or spotted eggs, and which do not breed in holes or in covered nests, just as albinism may occur in the bird itself in any species. Why then should abnormally pale eggs be considered as having any significance in the two species above cited?"

It seems to the present writer that Dr. Bishop was closer to appreciating the significance of his find than editor Allen, although he seems to have "gotten the cart before the horse" in using it as proof of the theory of protective coloration. If this were the case it would be a matter of natural selection operating in reverse. Bishop fails to follow through and explain why, lacking the need for protective coloration, all marsh wren eggs are not white. On the other hand Allen apparently failed completely to realize the possible significance of the white variant eggs in evolution and that what he called "albinistic" eggs are the rule, not the exception, in many species of hole-nesting birds. Among the wrens, the Short-billed Marsh Wren is the only one in North America that habitually has a pure white egg (Reed, North American Birds' Eggs: 317,1904). From the above cited records it is obvious that the potentiality is present in the case of the Long-billed Marsh Wren, and in view of the lack of survival value of brown eggs due to the covered nest, a pair of white-egg-producing Long-bills, if sufficiently isolated, could give rise to a white-egged race, just as the white-egged race of Short-billed Marsh Wrens may have evolved from brown-egg-laying ancestors. In this connection it is interesting to note that some South American races of *Cistothorus platensis* have eggs speckled with brown (Hartert and Venturi, Novit. Zool., 16: 163, 1909), so we see a recurrence of that typically wren-like characteristic even in that species.

The above-mentioned small isolated colony of Long-billed Marsh Wrens at Bay Point, Ohio, in less than five years after becoming established, produced several pairs of white-egg-laying birds, which is suggestive of a possible line of descent of the wide-ranging *Cistothorus platensis*. It might even be considered as an additional reason for placing the Long-billed Marsh Wrens back in the genus *Cistothorus*, where they formerly reposed, as is recommended by Hellmayr in the 'Catalogue of Birds of the Americas' (Part 6: 114, 1929).—JOHN W. ALDRICH, *Fish and Wildlife Service, U. S. Department of the Interior, Washington, D. C.*

Audubon and anting.—In the accumulating literature on the anting behavior of birds I have as yet seen no reference to what Audubon had to say on a cognate subject. On page 7 of the first volume of his 'Ornithological Biography' and again on page 48 of the 'Birds of America,' Vol. 5, he says of the young of the Wild Turkey after they leave the nest: "They roll themselves in deserted ants' nests, to clear their growing feathers of the loose scales, and prevent ticks and other vermin from attacking them, these insects being unable to bear the odour of the earth in which ants have been." This suggests a modified form of anting. Unfortunately Audubon does not give the evidence on which he bases his statement. He probably saw the operation, but his interpretation of its purpose may have been only surmise.—FRANCIS H. ALLEN, *West Roxbury, Mass.*

Evening Grosbeaks in southwestern Virginia.—In view of the general southward penetration of the Evening Grosbeak (*Hesperiphona vespertina*) in the winter of 1945–46, the following occurrence appears to warrant publication. The writer, after searching vainly in his home community of Emory, determined to look for the species in the residential sections of Abingdon, about ten miles west-southwest of Emory. Such a trip was effected on January 26, 1946, and the effort was rewarded, after thirty minutes of searching, by the discovery of eight of these birds flying into a sugar maple at the eastern edge of the town. In flight they resembled waxwings, but the apparent thickness of the bill suggested the advisability of studying them with my 8-power binoculars. The suspicion that they were Evening Grosbeaks proved correct, and all identification marks were noted even though light conditions were poor. Approximately half of the birds had the adult male plumage, but the exact number of these could not be determined.

This appears to be the southernmost of the few Virginia records for the Evening Grosbeak. On a later search (February 16) none of the birds could be found.—Henry M. Stevenson, *Department of Biology, Emory and Henry College, Emory, Virginia.*

Evening Grosbeaks in Maryland.—The infrequent and irregular winter visitations of the Evening Grosbeak *Hesperiphona v. vespertina* (Cooper) to the eastern United States have always aroused the interest of ornithologists.

The species breeds from western Canada (Alberta) to northern Michigan and is reported to drift into the eastern States in the middle of winter when certain of their preferred seeds are scarce on their normal range.

While hunting along Antietam Creek, about one mile east of Hagerstown, Washington Co., Maryland, on December 15, 1945, the attention of the author was attracted to a small flock of these grosbeaks feeding in a thicket. The ground was covered with about three inches of snow and the temperature was about 15° F.. A female was collected and sent to the museum at Cornell University.

Kolb and Bond (Auk, 60: 451, 1943) reported two adult males on January 17, 1942, near Towson, Baltimore Co., and in the same paper stated that a small flock was seen near Washington, D. C. in 1922 [*cf.* Auk, 40: 130, 1923—Ed.].—Woodrow W. Middlekauff, *University of California, Berkeley, California.*

Evening Grosbeaks in the Adirondacks in late June.—The Evening Grosbeak (*Hesperiphona vespertina vespertina*) is commonly reported as a winter visitant in the eastern United States, usually leaving for its more western range before May 15. It was with great interest therefore, that the writer observed two pairs of these attractive visitors on May 31, 1945, on the campus of the New York State Ranger School, on Cranberry Lake in the western Adirondacks. On June 3, three pairs were seen in the same vicinity, apparently feeding on the lawn and in the shrubbery about the grounds. Mr. James Dubuar, Director of the Ranger School, reported having seen several pairs previous to these two observations.

Of even greater significance was what appeared to be a nesting pair observed on June 27. Although the male was not seen, the female was recognized. Both individuals made their presence known by the constant reiteration of their very distinctive chipping call. The calls emanated from the middle and upper crown of a seventy-foot red spruce tree. It was here that the female was seen. This site was in a mixed hardwood-softwood stand about 350 feet from the shore of Cranberry Lake. Since there appeared to be only two birds, in such a restricted territory and at this season of the year, it seemed only logical to assume that it was a nesting pair.

A few days previous to this (June 24), Mr. P. J. Haddock of the Ranger School staff reported seeing six males feeding at the Ranger School dump. As far as is known by the writer, this species was not again oberved about the grounds this summer. Whether the pair observed in the forest continued residence could not be ascertained because the writer's duties called him elsewhere.

If there have been any observations of this species as late as, or later than, the above dates in the eastern United States, the author would indeed appreciate hearing of them.[1]—FRANK B. BARICK, *Roosevelt Wildlife Forest Experiment Station, Syracuse University, Syracuse, N. Y.*

Evening Grosbeak in West Virginia.—In a suburb of Fairmont, Marion County, West Virginia, on November 15, 1945, I observed a scattered flock of at least a dozen individuals of the Evening Grosbeak, *Hesperiphona vespertina*. An adult male and an adult female were collected, which Dr. George M. Sutton at the University of Michigan has determined as belonging to the eastern race, *H. v. vespertina*. The birds were tame, but moving about freely, and were seen to feed only upon the seeds of one small box elder tree. Both the specimens taken appeared to be in good condition and were extremely fat. While there have been a few recent sight records of this unmistakable bird in West Virginia, these are the first specimens on record from the state.—WILLIAM A. LUNK, *Bell Run Road, Fairmont, West Virginia.*

Chimney Swift (?) in Ecuador.—In late 1944, I was in the lowlands along the Río Upano, southeastern Ecuador, crossing over and going into the Cordillera Cutucú. I crossed the Upano the middle of November, working in the upper Cutucú until December 6, when I returned to the Upano. On my return to the lower elevations in the valley of the Upano, I noted that during the late afternoons and early evenings the sky was full of birds which I was certain were our common Chimney Swifts. They had not been there when I passed in November and the Jivaros said that the birds had arrived in the valley that week (the first week of December) and added that the birds always came there at about that time of the year.

On this particular trip my assistant, H. B. Jorgensen, was with me and also noted the birds. I pointed out the erratic flight of the swifts and we clearly distinguished between them and the various swallows in the valley. Later we both saw them again near Mendez and also along the Río Chupianza (a stream which joins the Paute-Upano system south of Mendez). An air-mail letter from Jorgensen, now working at Tenguel on the coastal plain of southeastern Ecuador, mentions that he had seen a large flock of the same birds crossing Tenguel that evening (December 7, 1945), apparently heading toward some of the valleys on the western slope of the Cordillera.

Remembering the controversy which was current some years ago when, as a beginning field naturalist, I was perhaps more actively interested in bird migrations than at present—and especially the controversy regarding the winter home of our Chimney Swifts—I wish to offer this observation. I might very easily be wrong in my identification of the species, but I have watched them so often during my field work in the States that it would seem that I ought to know a Chimney Swift when I saw it.—W. H. CAMP, *New York Botanical Gardens, New York 58, N. Y.*

Olivaceous Flycatcher in South Carolina.—The enviable reputation of Bull's Island, not only in South Carolina ornithology, but in that of the entire southeast as well, was upheld to a marked extent on November 27, 1945, when a flycatcher of the

[1] There is a record from Woodstock, Vermont, of birds nesting in 1926 (*Cf.* R. M. Marble, Auk, 43: 549, 1926).—ED.

ash-throated group was watched for some time by a group of observers comprising the third Audubon Wildlife Tour currently proceeding.

The writer, with seven other observers, was 'squeaking' up some small birds on the dyke bordering Jack's Creek Basin, when a medium-sized grayish flycatcher appeared suddenly and alighted on a small cassina (*Ilex vomitoria*) bush about 30 feet distant. Glasses were turned on it at once, and that it was something new was evident by the surprised exclamations which were uttered on all sides! It remained there in bright sunlight for several minutes, affording a perfect opportunity for detailed study. The writer's glasses are 9 × and the bird might almost as well have been in the hand as far as details were concerned.

It appeared somewhat larger than a Phoebe (*Sayornis phoebe*) and more slender; the head and back were distinctly olive brownish; two whitish wing-bars were present; the belly was yellowish and the wing edgings were rusty; the throat was decidedly gray. While, of course, unequivocal identification cannot be claimed for members of this group in the field, every indication pointed to the conclusion that the bird was an Olivaceous Flycatcher, *Myiarchus tuberculifer olivascens*, and it is this writer's belief that such is correct. Since Bull's Island is part of the Cape Romain Federal Bird Refuge, collection of the specimen was out of the question. The record is the first for the state.

While some may question the advisability of putting such a sight record as this in scientific print, it is done herewith because of the somewhat parallel case of a bird of this group being actually secured a year ago in the Pensacola, Florida, region, when Mr. F. M. Weston observed and recorded the Ash-throated Flycatcher (*M. cinerascens cinerascens*) on the Christmas Census in that area. Charleston is considerably to the eastward of Pensacola, but since the range of *cinerascens* is more western than that of *olivascens*, the difference is reduced to a parallel! Here are two far-western flycatchers observed in the east a year apart and there is a possibility that others are yet to be made known.—ALEXANDER SPRUNT, JR., *Southern Representative National Audubon Society, Charleston, South Carolina.*

Gyrfalcon in South Dakota.—Due to the fact that this bird is rare in South Dakota as a winter resident it may be of interest to note the following records.

A female was taken by Mr. Walter C. Thietje, October 22, 1945, near Red Lake, Brule County. At the time there was a concentration of ducks on the lake, mostly Gadwalls and Pintails, but the contents of the stomach of the Gyrfalcon showed the remains of pheasants. This was during the period of open hunting season and wounded pheasants would be easy food for hawks. On November 2, 1945, another female Gyrfalcon while flying over the same lake was taken by Mr. Thietje. The stomach of this bird was empty. These Gyrfalcons were collected by Mr. Thietje for the University of Iowa Museum and are now mounted for their Natural History Museum at Iowa City, Iowa.

A pair was taken in Sanborn County in 1905 and mounted by the late F. A. Patton. These birds are now in the Museum of the University of South Dakota, Vermillion.

Another single specimen, now mounted, was taken in the state and is now in a private collection.—W. H. OVER, *Director, University Museum, Vermillion, South Dakota.*

Notes on summer resident Wilson's Snipes in Columbiana County, Ohio.—Although I had found the Wilson's Snipe (*Capella gallinago delicata*) in Columbiana County, Ohio, in several summer seasons, I was long reluctant to consider it a nesting species because of its known propensity to linger south of its breeding

range. The discovery of a nest within the city limits of Salem on April 27, 1938, however, warrants the publication of notes on its summer occurrence. Prior to the discovery of its nesting, the species had been found eight times in five seasons at four localities on dates subsequent to the last regular migratory occurrences of the bird. Those regular final dates for seventeen migration seasons in Columbiana County have varied from April 24, 1937, to May 20, 1933, with a median of May 7, 1938 and 1944 (Paul A. Stewart). Apparently there has been but one previously published record of the nesting of Wilson's Snipe in Ohio (Hicks, Wilson Bulletin, 45: 181–182, 1933), although the presence of the species in summer had been matters of record for all the eastern tier of Ohio counties save Columbiana, in Portage County (Hicks, Ohio State University Studies, 40: 152, 1935), and at Fremont, Sandusky County (Bent, Life Histories of North American Shore Birds, 1: 94, 1927). Kirtland (2nd Annual Report on the Geological Survey of Ohio, 157–200, 1838) makes no mention of Wilson's Snipe as an Ohio breeding bird, and Wheaton (Report of the Geological Survey of Ohio, 4: 469, 1882) says that it is an "occasional summer resident in Northern Ohio, though no authentic instances of its breeding have been recorded." My records of summer occurrences of snipe in Columbiana County are as follows: July 20, 1931, one bird flushed from the extensive bur-reed marsh at Guilford Lake, Hanover and Center townships; June 20, 1932, one bird seen at almost the same spot; June 29, 1933, four full-grown birds walking together along the sedgy edge of Beaver Lake, Unity township, suggesting a group still held together by family ties; July 13, 1933, one bird seen again in the marsh at Guilford Lake; May 24, 1936, one bird in the air, "winnowing," at a marsh near New Chambersburg, West township; June 19, 1936, a single bird flushed from the edge of the pond at Watercress Marsh, Butler township, the last remnant of the once numerous glacial lakes of the area; July 6, 1937, another bird seen at the Guilford Lake situation. In addition to my records, Stewart saw one bird on May 28, 1933, at Guilford Lake, 300 yards from the point where four of my observations have been made. All of these areas had been combed numerous times in search of nests of the snipe, but without success.

Despite the fact that the marsh in Salem lies only a quarter of a mile from my former home, and despite its being the place where Wilson's Snipe has within my experience always been most numerous during the spring migration season, I had never searched there for a nest, nor, for many years, had I even visited the area following the close of the migration season, simply because it apparently was not an interesting ecological unit. Before drainage operations were begun early in 1938, the place was largely wet, unpastured meadow, with occasional clumps of cattail (*Typha latifolia*) and scattered willow bushes (*Salix* sp.). My field notes, however, should have suggested intensive search for the nest of Wilson's Snipe. On May 1, 1930, for instance, my notes reveal the observation of a snipe "sitting on a fence post, appearing to imitate the song of the flicker." This is the only occasion on which I have witnessed the perching of the species, a performance which doubtless is an adventitious act of tumescence. The only mention of similar action which I have seen recorded is by Wheaton (*op. cit.*: 470), who says, "Occasionally they alight on trees or fences." Also, for April 18, 1933, I find, "When the birds come to earth, they dive from a considerable height on set pinions to within a few feet of the ground. Again, when they flush from the ground, they make a continuous vocal sound which is not unmusical." Sutton (Wilson Bulletin, 35: 197, 1923) has described flight similar to this observed when he was within a few feet of the nest.

For a number of years I had been accustomed to take groups of my pupils to the marsh late in April to witness the winnowing of the snipe, and the finding of the nest

in 1938 occurred on such a trip. No snipe was to be heard on this morning, and only one bird was to be seen. But as one of the boys stepped across a small drainage ditch, a few moments after the lone bird had flushed from the ground, he planted his foot beside a nest containing four eggs which I immediately recognized as belonging to none of the four species of shore birds commonly nesting in the region. My field notes read: "The ground color of the eggs is olive, with most of the chocolate markings centered about the large end. They are sharply pyriform, a bit more than 1½" in length. The nest is built of grasses, on the ground, on earth thrown up from the ditch." It was no more than five feet from a clump of willow bushes. The eggs apparently were quite fresh, with no nest-soil on them. On May 5, however, when I returned to photograph the eggs, no trace of eggs, nest, or snipe was to be found. On the evening of May 3, in a portion of the same marsh three-fourths of a mile distant but which is now separated from the nest site by a built-up portion of the city, I had heard one bird winnowing. The last Wilson's Snipe which I saw in the spring of 1938 was observed on May 7 at Guilford Lake. A mental comparison, a short time later, of a series of Wilson's Snipe and other shore-bird eggs in the collection of the Carnegie Museum, Pittsburgh, confirmed my identification of the eggs. In the seven seasons since 1938, I have been in Salem only two, in 1940 and 1942. The character of the marsh had been altered by drainage operations so that there appeared little possibility in those years of the nesting of Wilson's Snipe on the site of the 1938 nest. Drainage has now been abandoned, and a skating pond which had been dug in 1939 has already become a cattail marsh, and the site may once again be favorable for the nesting of snipe. It is altogether probable that the species has nested in the other localities in which I have found it in summer. The nest-site and all other areas in which the species has been noted in summer are the remains of glacial lakes. The marshes at Guilford Lake and New Chambersburg are each within five miles of the boundary of the Wisconsin glaciers, south of which, in Columbiana County, there is little likelihood of the nesting of Wilson's Snipe, for the steep gradient of the streams flowing into the Ohio river prevented the formation of outwash lakes and their residual marshes such as occur in the unglaciated areas southwest of Columbiana County in Carroll County, where nests of Wilson's Snipe should also be searched for.—WILLIAM C. BAKER, *Department of English, University of Pittsburgh, Pittsburgh 13, Pa.*

First record of Harris's Sparrow in Connecticut.—On December 11, 1945, Mrs. Samuel D. Bogan first noticed a strange bird at her feeding tray in Spring Glen, Hamden, Connecticut. Peterson's 'Field Guide' helped her to identify it as a Harris's Sparrow, *Zonotrichia querula*. Through her kindness I was privileged to study it at a distance of three feet on several occasions during the week, and to compare it as readily with skins as though it were actually in hand. Several competent observers, including Mr. Robert S. Judd, who years ago collected in North Dakota an adult now in the Peabody Museum of Natural History collection, confirmed our determination.

This sparrow was in typical first winter plumage and apparently in excellent condition. Mixed bird seed proved so attractive that the bird frequently drove English Sparrows from the tray attached to the window ledge, to sit alone at leisure feeding for several minutes. Its fearless attitude suggested previous association with humanity, but no leg band confirmed this conception.

The bird frequented the shrubs and trees of the dooryard, feeding at the Bogan tray several times each day. On the afternoon of December 17, I had been taking motion pictures of it between 3:00 and 4:10 P. M. After its final extended feeding

it flew across the lawn to a Forsythia bush as was its wont. But instead of returning with the next descent of English Sparrows upon the feeding tray a few moments later, *querula* flitted over a hedge into the adjoining yard. As far as known, it has not since been seen.

According to the records available, three Harris's Sparrows have previously been noted in New England, all in eastern Massachusetts, and reported in The Auk in 1929 and 1936 (29: 392; 36: 92–93), and Bull. Mass. Aud. Soc., 28 (2): 45, 1944. This Hamden bird is believed to constitute Connecticut's first record of the species, thanks to Mrs. Bogan's intelligent interest.

A migrant of the great Central Flyway, the bird has been reported a few times in Michigan and Indiana, three times in Ohio (Auk, 48: 617, 1931; 50: 225, 1933; 42: 275, 1925; Bird-Lore, 42: 386, 1940). Perhaps a greater number of observers in Massachusetts and Connecticut have increased the likelihood of detection there as compared with New York State and Pennsylvania.

As always in such accidental visitations, one's imagination is aroused as to what factors may have led a western bird so far from its winter home. Certainly meteorologic conditions during the weeks previous to its discovery were more than once favorable to an eastward drive.

A storm center over Chicago on November 27 subjected the northeastern portion of *querula's* winter range in Missouri and the eastern border of its migration route through Illinois to strong westerly winds. This storm arrived in New England on December 1, accompanied in its early phases by strong west and southwest winds that could have carried the bird into New York or southern Ontario. A succeeding high, with strong southwest wind over the northern part of the winter range on December 4, reached northern New England on the 5th; and in turn, was followed by a low that moved up the coast, accompanied by west to northwest currents that might have deflected Harris's Sparrow into Connecticut. Finally, fresh to westerly winds accompanied a low-pressure area that travelled eastward through the northern States and southern Canada from December 7 to 11. The bird might well have been urged onward by the westerlies that prevailed south of this center.

This succession of storms covered a period of some 13 days. Had the sparrow left mid-northern Missouri on November 27, it would have averaged over 80 miles daily. That a bird accustomed to spending much time on the ground should maintain such progress eastward seems doubtful. Would it have been possible? The wind velocity probably never exceeded 45 m.p.h. Had it averaged 30 m.p.h. as a 'tail wind,' and had the bird added 20 m.p.h., the resultant would have been 50 m.p.h. Then only two hours flying time per day would have sufficed to maintain the rate of 80 miles per day.

If storms and winds are the major factors concerned, one would expect more than one of these birds to be carried eastward. Indeed, there is strong possibility that Robert Clem of Hamden may have seen an adult Harris's Sparrow at his food tray on December 20 and 21, about a half mile from the Bogan home. A boy unusually skilled in bird portraiture, he brought to me a careful drawing of an adult *querula*, seen from in front as it would have appeared on the edge of the food tray at his window. It hardly seems likely that wishful thinking could have led him to glorify thus an English Sparrow into a bird bearing black crown and striped flanks, as well as breast and throat.

Whether or not more than one Harris's Sparrow reached Hamden, we shall await possible reports of others seen in the northeast. Speculation as to how even this one bird reached New England must recognize the possibility that it may have been here

for weeks before its discovery. Perhaps in migration it was deflected southeastward from Manitoba across Ontario. Records of this species in eastern Canada seem to be lacking.—STANLEY C. BALL, *Peabody Museum of Natural History, Yale University, New Haven, Conn.*

A Whistling Swan in Cuba.—An adult male Whistling Swan, *Cygnus columbianus* (Ord), was taken December 17, 1944, near the Río Tumbadero and the Arroyo de los Horconcitos in the Ciénaga de Zapata, Cuba. There is no question as to the identification, because of the yellow spots on the lores and because of the distance from the eye to the nostril, which is much greater than that from the nostril to the point of the bill. This is the first record of the species for Cuba and for the West Indies. The specimen is preserved in the Museo Poey of the University of Habana.—ABELARDO MORENO, *Universidad de la Habana, Habana, Cuba.*

The White-fronted Goose in New Jersey.—The White-fronted Goose (*Anser albifrons*) is an extremely rare migrant on the Atlantic seaboard of the United States and specimens or authentic sight-records are few. From the coast of New York State (Long Island) there are reports of single specimens collected from Great South Bay in 1846, at Islip in 1849, at Montauk in 1872, and at Sag Harbor in 1889. To these may be added Helme's record of a flock of eleven seen at Miller Place in 1883. Two inland reports complete the published records for the state; one is a note of the presence of these geese on Chautauqua Lake in 1881 and the other of a specimen killed on Lake Champlain in 1943. From the New Jersey coast there have been but two occurrences reported: one, a single bird at Beach Haven Point in November, 1926 (Griscom), and the other, two White-fronts flying with a flock of Brant over Barnegat Bay in November, 1928 (Urner and Edwards). An addition to these New Jersey records may be of interest.

On November 16, 1945, we were walking south along the beach on the ocean side of Beach Haven Point, New Jersey, when we noticed a small flock of geese approaching from the north, flying just within the line of the surf at a height of about 75 feet. As soon as our glasses were on them we eliminated the possibility of the two common species and, as they flew directly over our heads, the speckled breasts and the characteristic head-markings of the adults showed them to be White-fronts. The flock consisted of five birds, two in adult plumage and three in the plumage of the immature of this species. An adult bird led the little flock. The sun was just setting and its light seemed to give a rosy tinge to the breasts of the adults as they passed low over our heads and swung around the Point, seeking the protection of the bay for the night.—MABEL M. AND C. K. NICHOLS, *Ridgewood, N. J.*

Burrowing Owl in Ohio.—My brother Norman called my attention to a small, fast owl along an open ditch southwest of Payne in Paulding County, Ohio, during the early part of October, 1944. It insisted upon roosting along the bare bank of a ditch that had been enlarged by a dredge a short time previously. On four occasions it was seen sitting on the bare bank of the ditch. Two attempts were made to secure it with a 40-gauge shot gun and both times it could have been shot at a distance of 40 feet. However we did not shoot it as it would have been ruined for a specimen. After flushing, it seemed very shy and would fly a considerable distance out in the harvested soy-bean fields where it tried to conceal itself under bunches of soy-bean straw. It did considerable walking. It was observed at one of its roosting places beside a four-inch tile where this drained into the open ditch. There on October 21 I collected eleven pellets of varying sizes. The pellets contained some fur but several

seemed to be composed principally of elytra of beetles and legs and wings of grasshoppers and crickets. A mental image of the owl matched up very well with Audubon's plate of a Burrowing Owl. I was impressed by the owl's falcon-like speed as it dashed down to alight on the bank of the ditch. While I have seen but three Sawwhet Owls in this region, they were observed in thickets and woodland. The pellets will be sent to some expert for determination of contents.—HOMER F. PRICE, *Payne, Ohio.*

Additions to the Florida list.—Western Burrowing Owl (*Speotyto cunicularia hypugaea*).—A specimen of this form was secured at the Naval Air Station, Pensacola, Florida, December 15, 1944, by Lt. Donald E. Stullken, USNR. Subspecific identification was verified by Dr. Alexander Wetmore and the skin is now in the collection of the U. S. National Museum, Washington, D. C.

Lt. Stullken, to whom I am indebted for the privilege of recording this occurrence, writes: "This bird was caught alive . . . [It] died a short time after it was brought in, apparently from some kind of poison. Examination of the stomach revealed several cockroaches which may have been the source of this poison." The bird was caught on the edge of the barracks area of the Naval Air Station on a bare flat of white sand sparsely dotted with clumps of coarse grass and stunted evergreen oaks. Lt. Stullken, who had had no opportunity to acquaint himself with the normal bird life of the region, is to be congratulated upon his initiative in preserving the specimen as an item of possible interest, in making the stomach examination and in recording the details of capture.

The Pensacola region lies between the normal ranges of the two North American forms of the Burrowing Owl, *S. c. hypugaea* and *S. c. floridana*. Howell (Florida Bird Life: 294, 1932) records the Florida form only from the Peninsula, with the most northerly occurrence about 300 miles east of Pensacola. The western form is known to occur with some regularity in southern Louisiana, extending its winter range as far east as the coast of Mississippi to a point about 150 miles west of Pensacola (Burleigh, The Bird Life of the Gulf Coast of Mississippi, Occ. Papers Mus. of Zool., La. State Univ., No. 20: 389, Dec. 30, 1944). Howell (Birds of Alabama: 155, 1924) records a Burrowing Owl taken by him on February 3, 1912, on Blakely Island, Alabama (about 50 miles west of Pensacola) and referred by him to the western form. Later, Bent (Life Histories of N. A. Birds of Prey, Pt. 2, U. S. Nat. Mus., Bull. 170: 396, 1938) refers Howell's Blakely Island specimen to *S. c. floridana*, an opinion that is concurred in by Dr. J. W. Aldrich, U. S. Fish and Wildlife Service (*in litt.*).

In view of the Gulf Coast distribution summarized above, a Burrowing Owl reported to me by Mr. Frank Bray at the Pensacola Municipal Airport, October 11, 1940, and seen by me and others of a party of observers on October 12 and on subsequent dates, could have been of either the western or the Florida form, with probability favoring the former. Unfortunately, it was not practicable to collect the specimen.

Ash-throated Flycatcher (*Myiarchus cinerascens cinerascens*).—A specimen of this species, taken on Town Point on the south side of Pensacola Bay opposite the city of Pensacola, Florida, December 24, 1944, was identified for me by Dr. John W. Aldrich, U. S. Fish and Wildlife Service. This is, so far as can be discovered, the only recorded occurrence of this species east of Colorado and central Texas.

The bird was found by a party of observers (Lt. E. J. Koestner, USNR, and others) engaged in making the annual Christmas Bird Count for Audubon Magazine. They were able to follow the bird around for some minutes, observe its manner of feeding,

listen to its call notes, etc. Later, the bird was shot in their presence by a youthful "hunter." Fortunately, they realized the interest of the specimen and preserved it. The area in which the bird was found, and in which it seemed to be making a satisfactory living, is typical of much of this section of the Gulf Coast—a level terrain of white sand, thickly grown with evergreen oaks of several dwarf species. It was in just such a spot, and only 20 miles to the eastward, that I secured another desert species, Palmer's Thrasher (*Toxostoma curvirostre palmeri*), some years ago (Auk, 49: 484, 1932).

Philadelphia Vireo (*Vireo philadelphicus*).—A specimen of this species, the only one known from Florida, was taken by me at a point about eight miles northeast of Pensacola, September 28, 1941. It is now in the collection of the U. S. Fish and Wildlife Service, Washington, D. C.

Howell (Florida Bird Life: 475, 1932) includes the Philadelphia Vireo in his hypothetical list on the basis of 'sight' records of mine of April 18 and 19, 1919, and October 6, 1926. I did not see another until October 2, 1938, when, in a patch of live-oak woods northeast of Pensacola, I shot one and lost it in the undergrowth. Three years later, in the same spot (and I believe in the same tree!), I succeeded in securing the specimen that is the subject of this note.

Since that time, this vireo has been noted on several occasions in the Pensacola region, and it should now be considered a regular, though very rare, spring and fall migrant through extreme western Florida. The dates of recent observations are: March 29, 1942, one bird reported by Alan C. Sheppard (a competent observer, who had aided me in securing my specimen a few months earlier); October 1, 1944, four birds, two at a time in widely separated localities, were seen by me and other members of my party; and October 8, 1944, one bird seen by the same party.—Francis M. Weston, *2006 East Jordan St., Pensacola, Florida.*

Notes from Idaho.—It may be of interest to record that I have recently seen Starlings in numbers in and about American Falls and Aberdeen, Idaho. Later, on February 10, I observed them on the R. V. Swanson ranch about four miles west of Pocatello. There were about 75 of them in a flock of approximately a thousand Brewer's Blackbirds and Redwings. Again, on February 16, I counted 36 in the same vicinity.

On February 17, while I was in the company of Mr. Victor Jones, Dean John R. Nichols, and Dr. C. W. McIntosh, Jr., two Starlings were collected, making the first authenticated record of the species in Idaho. The birds were rather shy and extremely difficult to approach, keeping well out of range during most of the afternoon when we were watching them.

I was also fortunate on February 16 in seeing a large female Duck Hawk take a hen Mallard in a very spectacular flight east of the Swanson ranch. The Duck Hawk rose from a fence post and soared up several thousand feet with no indication of hunting. Then it made several half-hearted swoops at several large flights of ducks milling around local grain fields. Finally, a rather small group of Mallards rose beneath the falcon and started away down wind from it. In one long stoop the falcon singled out a hen, later observed on the ground, and killed her with two blows, the first of which seemed to knock her about in the air and the second to finish the kill. I watched the falcon plume the duck and begin to eat it before I left.—Harold M. Webster, Jr., *Pocatello, Idaho.*

The Barbets—Errata and Addenda.—The paper which the author presented on the barbets in The Auk, 62: 542–563, 1945, went to press while he was overseas.

Thus, unfortunately, there were several omissions which were entirely unintended and which it is hoped here to rectify. For welcome help in this matter the author is indebted to Messrs. James L. Peters and James P. Chapin.

The Tropical American Barbets

P. 549. To the species *Capito niger* should be added the subspecies ***transilens*** Friedmann (Proc. Biol. Soc. Wash., 58: 113, 1945), from the upper Rio Negro, Brazil, north of the range of *C. n. hypochondriacus*.

P. 549. *Capito dayi* should be maintained as a separate species (***vide*** Peters in litt.) due to its overlapping range with *C. n. insperatus*.

The Asiatic Barbets

P. 555. *Megalaima eximia* with the race *cyanea* should be maintained as a separate species distinct from *australis*, rather than as arranged by Chasen (Bull. Raffles Mus., No. 11: 138, 1935).

The African Barbets

P. 558. The question of whether to keep *Pogoniulus anchietae* as a species or split it into two with *sowerbyi* has been rendered more confusing by White's recent paper (Ibis, 88: 72, 1946). In this paper a specimen of ***"Buccanodon" a. stresemanni*** is listed from Ndola, the type locality of White's race *buttoni*. Presumably the Ibis paper was prepared before he decided to describe *buttoni* and so this record is an oversight. It would probably be better to keep *anchietae* and *sowerbyi* as distinct species until the range of *katangae* is completely understood.

P. 558. According to Grant and Mackworth-Praed (Bull. Brit. Orn. Club, 58: 84, 1938), ***"Buccanodon" belcheri*** should be included in the species ***olivaceum***.

P. 561. The species *Lybius guifsobalito* includes the race ***rubrifacies*** from the area southwest and west of Lake Victoria.

P. 561. [*Lybius*] ***zombae*** (Shelley) is a species which was omitted by mistake. It should be inserted between *melanopterus* and *torquatus*. The range as given by Sclater (Syst. Av. Aeth.: 271, 1930), is Nyasaland southeast of Lake Nyasa. Included with it is the race *albigularis*.

P. 561. [*Lybius*] ***chaplini*** Clarke, a distinct species not far from ***leucocephalus***, was inadvertently dropped from the final draft of the MS. The range of this species is the Kafue Valley, Northern Rhodesia.

P. 561. The name *levaillanti* is preoccupied. This species should be called *Lybius minor* (Cuvier).

P. 562. In the linear arrangement, the species ***Trachyphonus vaillantii*** should be listed between *darnaudii* and *purpuratus*, linking the short-billed uncrested bird with the group having crests and long, compressed bills (Peters, in litt.).

P. 562. The species *Trachyphonus margaritatus* includes two races, ***berberensis*** from Zeidab, Sudan, and *kingi* from Erkowit, Sudan, which have not been seen by the author.—S. Dillon Ripley.

RECENT LITERATURE

A Naturalist's Scrapbook.[1]—Before his recent death, Thomas Barbour was engaged in the enjoyable task of selecting, from a lifetime of varied experiences, an assemblage of incidents and anecdotes to make a series of little volumes. The present book is the second of the series, having been preceded by his 'Naturalist at Large.'

To those of us who knew Dr. Barbour, these books have a particular interest since they are so personalized, but there is much in them that makes good reading for the general public, particularly for those persons whose interests lie in natural history.

In the present volume, the early chapters deal largely with the "Agassiz Museum," officially the Museum of Comparative Zoölogy, at Cambridge, Massachusetts, with which Dr. Barbour was associated for so many years. Its origin and early history are briefly told, beginning with a collection, destroyed by fire in 1764, that was preserved in Harvard College and for which the claim is made that it was the first natural history museum in the United States. Accounts are also given of the Boston Society of Natural History and the Peabody Museum at Salem, Massachusetts, with both of which the author had an active connection. The record, therefore, embraces a variety of museum activities in the Boston region. The account frequently involves the discussion of general museum aims and practices, of exhibition and labeling, and of storage and utilization of collections, on all of which Dr. Barbour's long museum services entitled him to speak with authority. There are also many amusing anecdotes such as that of the collection of shells which had been marked 'Do not disturb' and which had been left untouched and forgotten for over eighty-five years, long after the person had gone who wrote the inscription on the boxes! A chapter on certain rare and historic birds is of special interest to ornithologists.

In the latter part of the book, Dr. Barbour gives some of his experiences while on a visit to the East Indies many years ago, and takes occasion to comment on a number of problems in natural history that these experiences brought to mind.

The title of the book is, however, well chosen. It is not a connected discourse but is made up of a series of reminiscences on a variety of topics, related to each other through their common ground of natural history and the author, and together making a readable and entertaining volume.—J. T. Zimmer.

The Birds of Réunion.[2]—The history of the small but fascinating avifauna of the Mascarene Islands provides one of the most dramatic episodes of the destruction of birds by man. Réunion (first called Ile Bourbon), Mauritius (former Ile de France), and Rodriguez, isolated in the western part of the Indian Ocean to the east of Madagascar, have remained entirely unspoiled and uninhabited until their discovery by European explorers in the first years of the sixteenth century, for Réunion apparently in 1505. Undisturbed by man and mammals since their origin, the fauna of these islands had evolved under special conditions of security, producing defenseless and even flightless creatures, such as the famous Dodos. Most of them were quickly exterminated by the ruthless invaders. A little more than a century later, the largest forms had become extinct; the Réunion Dodo or "Solitaire," the last one to survive, finally disappeared around the year 1740. In Mauritius and Rodriguez, bones of the victims have been found, and their identification is therefore

[1] Barbour, Thomas. 'A Naturalist's Scrapbook.' 8vo, pp. x + 218, 17 pls., 1946. Harvard University Press, Cambridge, Mass. Price $3.00.

[2] Berlioz, Jacques. 'Oiseaux de la Réunion.' 4to, pp. 1–83 [Faune de l'empire Français, 4, Larose, Paris], 1946.

easier and more certain. No such deposits have been found in Réunion, and the accounts of early travelers form the basis of our information, particularly those of Tatton (1625) and Du Bois (1674) are of great value, if rather difficult to understand at times.

J. Berlioz has treated the subject with his usual care and clarity. After a short introduction, his work is divided in two parts: the old avifauna of Réunion, and its present avifauna. The first and shortest part is also the most captivating as it condenses and interprets whatever knowledge has been preserved on the Dodo or Solitaire, a distinct species—apparently very different from that of Mauritius—various parrots—among which the famous *Mascarinus* is conspicuous (a good specimen exists in the Paris Museum)—the Crested Myna (*Fregilupus varius*), and other vanished treasures. The present avifauna is made up of sea birds and migrant waders, of introduced species and of some endemic forms which have preserved a foothold, some only precariously. The most interesting ones among them are the harrier (*Circus maillardi*), the swiftlet (*Collocalia francica*), the swallow (*Phedina borbonica*), the Paradise Flycatcher (*Tchitrea borbonica*), the chat (*Saxicola borbonensis*), the bulbul (*Microscelis borbonica*), the graybird (*Coquus* [*Coracina*] *newtoni*), two white-eyes (*Zosterops curvirostris haesitatus* and *Malacirops borbonicus*).

This small book is well printed on good paper, and has numerous line illustrations. It is full of precise information on a most interesting subject.—Jean Delacour.

A laboratory and field manual of ornithology.[1]—With the inclusion of many new sections and new illustrations, and a revision of some of the earlier sections, this edition of Pettingill's manual is ostensibly a new book. The manual was first published in 1939 and was developed while the author was teaching ornithology and directing student investigations at Carleton College and the University of Michigan Biological Station.

As stated in the preface, "the manual is designed primarily for use in ornithological study and research at the college and university level" by students who have had a college course in general zoology or biology. The manual is divided into eighteen sections which vary considerably from mere outlines of material to be learned to long, detailed, and highly organized units on various phases of ornithology. Each section, with few exceptions, includes some directions for observational studies and a bibliography.

The manual, for all practical purposes, can be divided into two parts. Part one comprises the first ten sections and includes those topics which are presented in the elementary course. These sections are studied in the laboratory prior to the spring migration and include the following subjects: topography, feathers and feather tracts, classification and nomenclature, external structural characters, laboratory identification, plumages and plumage coloration, and distribution and migration. After the spring migration begins, the class work emphasizes the recognition of birds in the field and the identification of prepared skins of the species observed. During this period, only two sections of the manual are used, those on field identification and bird ecology.

The content and presentation of the material in this part of the manual, exclusive of the sections on bird ecology and distribution and migration, are good. The sections are well organized; the directions are clearly given; the facts are accurate for the most part with only a few cases of questionable terminology; the outline drawings are

[1] Pettingill, Olin Sewall, Jr. 'A Laboratory and Field Manual of Ornithology.' Pp. v + 248. Plates I–XX, numerous text-figures (Illustrations by Walter J. Breckenridge), 1946. Burgess Publ. Co., 426 South 6th Street, Minneapolis, Minnesota. Price $3.50.

satisfactory, and the exercises are well adapted for laboratory study. In the opinion of the reviewer, however, an elementary course in ornithology with the content, organization and method of approach as given in this manual does not provide the best training for beginning students, whether or not they will continue in ornithology. The elementary course that is outlined above undoubtedly represents the traditional and hence most readily accepted method, but is it necessarily the best method? Why, for example, must students wait until the spring migration begins to start their field work? Why not have a regular weekly field trip of three or four hours for observing birds and taking detailed notes, especially in February and March when there are fewer species? Of what advantage is it to a beginning student to learn how to identify many birds, if he has little or no training in how to observe birds? Too many of our beginning students are overimpressed with the importance of obtaining large lists of species on field trips, and are not sufficiently cognizant of birds as organisms. The primary objective of a course in ornithology should be the study of birds as organisms and this obviously implies a biological frame of reference.

The reviewer takes issue with the excessive amount of structural detail and classification intended for the elementary course. For example, in the section on classification and nomenclature, Wetmore's classification of the birds of the world is given in full, except for the families not found in North America north of México. The student is told that he should know the names of the orders and families and their sequence! This undue emphasis on taxonomy is shown again in the section on external structural characteristics and laboratory identification. Admittedly, this material lends itself well to laboratory study, and undoubtedly will impress beginning students with the complexities of the science of ornithology. At the same time, however, it gives them a very distorted impression of the nature, content and objectives of ornithology as a branch of biology.

The emphasis on taxonomy becomes further exaggerated because of the very inadequate treament of bird ecology, not only for the elementary course, but in the manual as a whole. For the beginning student, there are two sections with ecological material, one entitled bird ecology, the other, distribution and migration. Under distribution, the emphasis is on biotic communities with a summary of the eight major types in North America and the avian species associated with each. Under bird ecology, the biological and physical factors that affect birds are given in brief outline and adapted primarily from Kendeigh.

In the opinion of the reviewer, the presentation of the ecological material in these two sections will probably contribute to a confused attitude on the part of the student regarding the meaning of ecology, particularly as related to birds. As given in the manual, it is not clear that the concept of communities has resulted from studies in ecology, and is an integral part of it. Rather, one gets the impression that it is a separate, independent avenue of approach in ornithology. This same criticism is applicable to the sections on bird communities and bird populations in the latter part of the manual. All of this material could well have been grouped together and organized within an ecological section. Such a procedure would have avoided the inevitable confusion which results from a discussion of bird communities apart from ecology, and apart from biotic communities. Is there any basis in ecology for such a concept as the bird community? How would it differ from a biotic community? Even the adjective 'biotic' seems superfluous, for no community exists without plant and animal organisms. The weakest part of the manual is the organization and treatment of the ecological material, and perhaps some clue for this weakness may be found in these concluding statements which are found at the end of the section on

bird ecology (p. 139): "Specific problems in the study of bird ecology are complicated, exacting, and time consuming. They are, therefore, not considered appropriate for a beginning course in ornithology."

The second part of the manual consists of the last eight sections, which are used in the advanced course given at the Biological Station. Of these eight sections, only two are taken up in the field, bird communities and bird populations. These have already been considered. The remaining six sections deal with various phases in the breeding cycle and are used as a study text. At the end of each of these sections, directions are given for observations in the field, and also included are the recent and acceptable methods for the presentation of the data. The topics included in these sections are: territory; mating; nests and nest building; eggs, egg-laying and incubation; young and their development; and parental care. The material included summarizes fairly well the known information to date, and presents it in a highly organized manner. However, because of the necessary brevity in each section, and because these sections are used as text material for advance students, might it not be preferable to provide the students with the original sources? These are relatively few in number and accessible, and would have the advantage of putting the student in touch with the original investigations.

Two important questions of usage appear in these sections. The term 'mating' is used instead of 'pair formation' and is differentiated from 'copulation.' The terms 'proestrum' and 'oestrum' are applied to the breeding cycle of the female to indicate her initial unreceptive and later receptive period of response to the male. This usage is certainly regrettable, for despite the apparent similarity between the breeding cycles of some mammals and birds, the biological connotation of the oestrous cycle precludes the possibility of applying the concept to birds.

With regard to the organization of the advanced course, it seems that it is little more than a detailed study of the breeding cycle. In the opinion of the reviewer it would have been highly desirable to include text material on the origin of species, bird psychology, and recent experiments on the physiology of wild birds. Moreover, much of the material on classification and structure might well be included in the advanced course, and much of the life history material offered as text material in the beginning course.

A very useful and valuable feature of the manual is the number of bibliographies. There is one at the end of all but two of the sections, and although no attempt has been made to make them complete, they have been brought up to date, and include for the most part the significant contributions in each subject treated. In addition to these sectional bibliographies, there are four appendixes containing bibliographies of life history studies, state works on birds, bibliographies pertaining to ornithology, and books for general information and recreational reading. Included in the appropriate bibliographies are the masters and doctoral theses at Cornell University and the University of Michigan, but not at other institutions. References to foreign literature are too few throughout the manual especially for the important contributions, and since the manual is intended in part as a guide for research at the college level this is an unfortunate omission. Groebbels's two-volume treatise on the bird is not mentioned at all, and Stresemann's excellent monograph on Aves is mentioned only in the bibliography on nests and nest-building. This lack of consideration for such classic contributions to ornithology is indeed surprising.

In addition to the four appendixes mentioned, there is one on ornithological field methods, which includes a section on bird weights that is in need of revision; another on the preparation of a paper; and a concluding one on current North American

ornithological journals. Listed in this last appendix are 22 journals besides the four prominent ones! It seems incongruous to see so much space provided for so many small American journals, and no mention of the significant foreign journals.

The manual is printed in photo offset, is attractive in appearance, and has a convenient spiral binding. Enhancing greatly the appearance of the book are the illustrations by Walter J. Breckenridge. The book has been well edited, and there are few typographical errors. A curious omission is the figures for plate IV.

Those who agree with the plan and content of the manual for elementary and advanced courses in ornithology will find it well suited to their needs. For others, the manual is recommended for its comprehensive and useful treatment of the structure and classification of North American birds, and for its concise summaries of the phases of the breeding cycle.—ALBERT WOLFSON.

Catalogue of Argentine birds.[1]—It is pleasing to see another instalment of this important work which was begun in 1935 (*see* Auk, 53: 355, 1936) and of which the preceding part appeared in 1939. The present portion concludes the parrots and takes up the cuckoos, owls, goatsuckers, swifts, hummingbirds, trogons, kingfishers, and motmots.

As in preceding parts of the work, there are critical notes on many of the forms, with extended bibliographies for all of them, lists of specimens examined, and statements of the geographic distribution, extralimital as well as Argentine. The result, therefore, is considerably more than a simple catalogue of species and subspecies but brings up to date, for the groups treated, the authors' conclusions concerning the status of the various forms known or recorded from Argentina.

The future instalments of the work will be awaited with interest.—J. T. ZIMMER.

Birds of Sonora, México.[2]—This is the most comprehensive paper on Mexican ornithology that has appeared for some time. No less than 532 species and subspecies are recognized by van Rossem from Sonora and 37 have been reported from the state on evidence which van Rossem finds questionable. There have been 111 forms described from Sonoran specimens of which ten are considered synonyms of other forms and one a hybrid. How many of the total list are true endemics and how many are seasonal visitants is not told, which would be a matter of more than academic interest. Sixty-eight collectors are named as having been active in the collection of Sonoran birds in addition to one whose name is not known.

The author recognizes five avifaunal "provinces"—the Sonoran, Sinaloan, Apachian, Durangan, and San Lucan, with the addition of the off-shore maritime element for which a distinctive name is postponed. Each of these areas is briefly characterized and delimited with a general map showing the positions, and a gazetteer of collecting localities within the state forms a useful adjunct, as do the various maps showing the distribution of certain of the species.

Most of the text is devoted to a discussion of the Sonoran distribution of the various forms, accompanied by the bibliographic references to the pertinent records and such unpublished records as are known to the author. In some of the cases where further comments are needed or a change in the author's previous conclusions have been made, there is a brief review of the evidence in support of the stand taken in the text.

Two new subspecies are described: *Icterus bullockii parvus*, with Jacumba, San

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[1] [STEULLET, ALFREDO B., AND DEAUTIER, ENRIQUE A.] 'Obra de Cincuentario del Museo de La Plata. [Catálogo Sistemático de las Aves de la República Argentina].' Tomo 1, Cuarta Entrega, pp. 733–932, 1945. Universidad Nacional de La Plata, Instituto del Museo.

[2] VAN ROSSEM, A. J. 'A distributional survey of the birds of Sonora, México.' Occ. Pap. Mus. Zool. Louisiana State Univ., No. 21: 1–379, maps 1–26 (1 col.), Oct. 25, 1945.

Diego County, California, as type locality, since the subspecies occurs in Sonora only as a migrant; and *I. cucullatus restrictus*, from Agiobampo, Sonora.

It is gratifying to see so extensive a paper on Mexican birds since, in spite of its proximity to the borders of the United States, México has long been in need of comprehensive studies of its bird-life. It is hoped that the present paper will be followed by others dealing with other states of our sister republic.—J. T. Zimmer.

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CORRESPONDENCE

African Capitonidae

The Editor of The Auk:—

In the Auk for October, 1945, Mr. S. Dillon Ripley discusses the Capitonidae. One or two aspects of it call for comment so far as the African species are concerned. In the species and subspecies listed, several very well marked forms are not mentioned. Thus there is no reference to either *Lybius rubrifacies* or *Lybius chaplini;* whilst among subspecies generally accepted as valid, *Gymnobucco calvus congicus, Lybius torquatus zombae,* and *Buccanodon olivaceum belcheri,* as well as several others, are omitted from the lists. Mr. Ripley keeps the *Buccanodon anchietae* and *Buccanodon whytei* groups as conspecific and adds a footnote that the occurrence of *Buccanodon anchietae katangae* and *Buccanodon whytei buttoni* in the Ndola district requires very careful checking. I may therefore be permitted to remark that the careful checking has already been done over a period of continuous field observation for more than two years by Mr. E. L. Button whilst he was stationed there and good series of both forms were collected. Both forms occur together throughout the year about the Ndola township and there cannot be the slightest excuse for regarding the *anchietae* group as conspecific with the *whytei* group.—Charles M. N. White, *Balovale, Northern Rhodesia.*

Bent's 'Life Histories of North American Birds'

Editor of The Auk:—It may interest some of your readers to know that I have a contract with Dodd, Mead and Company, 432 Fourth Ave., New York 16, N. Y., to publish a reprint of my Bulletin 107, Life Histories of North American Diving Birds. It will probably appear some time next fall or winter. The price and the format will be announced by the publishers in due course. As the edition will be limited by the probable demand, it might be wise for those who lack this number to notify the publishers that they would like to have an opportunity to purchase a copy.

If the demand seems to warrant it, some of the other rare numbers may be reproduced.

Also, I have a complete set of my Bulletins, 14 volumes, all published, including Bull. 107, for sale for the widow of a friend to whom I gave them. All but one of them are autographed by me for my friend. They are to be sold to the highest bidder, f. o. b. here and at buyer's risk.—A. C. Bent, *Taunton, Mass.*

NOTES AND NEWS

THE AUK must sorrowfully record the loss of Dr. Thomas S. Roberts, Fellow of the A. O. U., who died in Minneapolis, Minnesota on April 19, last.

IN THE last (April, 1946) number of The Auk there was a brief note of the death of Clinton G. Abbott, who had been the director of the museum of the San Diego Society of Natural History for the past twenty-four years. During his tenure of office he had built up the museum from a purely local institution to one of the more important organizations of its kind in the country. In appreciation of his character, and in acknowledgment of his services to the museum, the society has established a fund to be known as the Clinton G. Abbott Memorial Publication Fund, all contributions to which shall be invested, and the interest alone used to finance the enlarged publication program of the society. Friends and admirers of Clinton Abbott, wherever they may be situated, are invited to contribute. Checks should be made out to the San Diego Society of Natural History, marked "Abbott Memorial Fund," and mailed to Arthur C. Wells, Treasurer, c/o The San Diego Trust and Savings Bank, 540 Broadway, San Diego 1, California.

The Sixty-fourth Annual Meeting of the A. O. U.

The American Ornithologists' Union will hold its first full annual meeting since 1942 on September 2 to 5 in Urbana-Champaign, Illinois. This will be a regular meeting, with presentation of papers, a banquet, social gatherings, and field trips. Headquarters will be in the new Illini Union Building of the University of Illinois, where the business meetings on Monday, September 2, will be held. An excellent cafeteria is available, and conference or lounging rooms will be at the disposal of members and visitors.

Most of the public sessions will be held in Gregory Hall on the campus. This building is air-conditioned and will be comfortable even if the weather is warm. The main University auditorium will be available for an evening session with motion pictures. There will be an opportunity to inspect the equipment and research under way in the Vivarium Building and at the Illinois Natural History Survey. Field trips of both a half-day and a whole day's duration are being planned.

Reservations for rooms should be made immediately at either the Inman Hotel in Champaign or at the Urbana-Lincoln Hotel in Urbana. Guests who cannot be accommodated by the hotels will be placed in rooms in private homes.

The meeting is sponsored by the Department of Zoology and Physiology of the University of Illinois, the Illinois Natural History Survey, and the Champaign County Audubon Club. The chairman of the Local Committee on Arrangements is Dr. S. Charles Kendeigh, Vivarium Building, Wright and Healey Streets, Champaign, Illinois.

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JOHN T. ZIMMER
American Museum of Natural History
79th Street and Central Park West
New York 24, N. Y.

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